

PRENTICE-HALL PSYCHOLOGY SERIES
F. A. MOSS, Ph.D., M.D., EDITOR

Fundamentals of Psychology
in
Secondary Education

PRENTICE-HALL PSYCHOLOGY SERIES

F. A. MOSS, PH.D., M.D., EDITOR

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Fundamentals of Psychology *in* Secondary Education

by

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Preface

THE character of a science is determined largely by the demands of civilization. The biological and physical sciences have each encountered the need for greater precision in human judgments and for gathering accurate data based upon carefully controlled experiments. The social sciences have also recognized a similar need. With the advancement of our civilization and the corresponding advancement of our institutions, new demands have evolved. The demands made on our schools at the present time have turned the main course of psychological interest away from the philosophical aspects to a distinctly experimental approach to the problems of education. The writers claim for the study presented in this volume a scientific approach to the special period of education with which it is concerned, the secondary-school period.

This volume is an outgrowth of several years of classroom experience, on the part of both authors, with high-school boys and girls, followed by years of study of the characteristics of learning and growth during this period. One of the authors has offered courses in the psychology of secondary education for the past thirteen years, while the other author has offered such courses for the past eight years. During these years, the authors have attempted to examine a major portion of the large number of studies that have appeared in this and related fields. The varied emphases and interests of the authors have been co-ordinated into a more balanced study through

their close contacts and constant conferences. Thus, the volume is divided into three major divisions. These are: Part I, "Progress Toward Maturity," Part II, "The High-School Subjects," and Part III, "Personality Development."

Concerning the function of educational psychology, the authors pointed out in the "Preface" of an earlier volume, *The Psychology of Elementary School Subjects*, that the aims of education must be left largely to philosophy and the social sciences, but that educational psychology is concerned with the processes by means of which these aims are to be attained. The writers believe that psychology can give support to this function through the more specific application of the facts and principles that have been formulated in the psychological laboratory to the problems of educating youths for adjustment in life's activities. *Fundamentals of Psychology in Secondary Education* is an effort in this direction, but is focused on the secondary-school period. The purpose of the book is not to inform the reader about psychology or psychological facts and theories as such, but rather to present a more definite and clearer application of the principles of psychology to the problems of learning and personality growth in high school. The adolescent pupil is conceived of as an individual who has developed out of a biological inheritance but has been modified in harmony with various environmental forces with which he has come into contact. His growth is thus seen as gradual and unitary in nature, rather than as a spasmodic growth of isolated characteristics and traits.

Quantitative materials have been presented so as to give the reader more specific and accurate notions about the different problems studied. The writers have tried, how-

ever, not to burden the student with an abundance of well-nigh meaningless data. Those data presented have been carefully selected and are designed to make the various discussions more meaningful and significant to the reader.

Acknowledgments for all data quoted and all materials used are presented in the form of footnote references. The authors also wish to express their gratitude to the numerous publishers, authors, and students of education and psychology who have contributed either directly or indirectly to the production of the materials germane to this study.

S. C. GARRISON
K. C. GARRISON

Contents

	PAGE
PREFACE	V
CHAPTER	
I. APPLICATION OF PSYCHOLOGY TO SECONDARY ED- UCATION	1
Increasing importance of education	1
Education and social dynamics	3
Danger of over-standardization	4
What is teaching?	5
Psychological trends	6
The experimental method	8
What is learning?	9
Reflective judgment	11
Some recent trends in scholarship	11

PART I

PROGRESS TOWARD MATURITY

II. DEVELOPMENT AND THE INDIVIDUAL	17
Importance of the developmental point of view for teachers	17
What is meant by development?	18
Factors in development	19
How development occurs	20
Empirical principles	22
Inheritance of acquired characters	24
The maturation hypothesis	25
Developmental psychology and our under- standing of behavior	27
Unity in growth	28
General characteristics of development	30
All development carries social obligations	38

CHAPTER	PAGE
III. PHYSICAL DEVELOPMENT OF THE HIGH-SCHOOL	
PUPIL	41
Physical development	41
Variation in pubescence	43
Methods of studying physical development	45
Growth in height and weight	47
Anatomical development	51
Lack of uniformity in growth	53
Physical growth resulting from exercise	56
Interrelation of traits	58
IV. MENTAL DEVELOPMENT OF THE HIGH-SCHOOL	
PUPIL	61
What is meant by the terms mental ability and intelligence?	61
Physical basis of mentality	64
Mentality and mental content	66
Measuring mental development	66
Constancy of mental growth	70
Pubescence and mental growth	71
Intelligence and age of mental maturity	72
Maturity in logical memory	73
Educational implications	74
Relationship between mental and physical development	75
Physique and intelligence	76
Summary	77
V. INDIVIDUAL DIFFERENCES	80
The distribution of individual differences	80
Distribution of abilities in school	82
Individual differences in intelligence	83
Mental inferiority	84
Mental superiority	87
Some causative factors in individual varia- tions	89
The family tree	89
Co-twin study of individual differences	91
Kin resemblance in intelligence	92

CHAPTER	PAGE
V. INDIVIDUAL DIFFERENCES (<i>Cont.</i>)	
Evidence from a study of foster children	95
Environmental factors	96
Significance of sex	98
Errors in evaluation	99
Educational variations	102
Educational provisions	107
VI. SOCIAL DEVELOPMENT DURING THE HIGH-SCHOOL PERIOD	111
What is meant by social development?	111
Some factors influencing social development	112
• Primary and higher emotions and their role in social behavior	113
Social versus individual development	115
Social training and participation	116
The high school and social maturity	117
The importance of citizenship training	118
Social development and self-expression	120
Play and moral development	121
Social studies and social development	122
Science and social development	122
Summary	124
VII. INTERESTS AND ATTITUDES	127
The origin of interests and attitudes	128
The meaning of interest	129
Growth of interests and attitudes	131
Ability and interest	132
Interest in play	134
The adolescent's interest in school	138
Mental ability and the high-school subjects	139
Reading interests	141
Vocational interests	143
VIII. MOTIVATION AND LEARNING	148
Motivation and drives	149
Incentives	150
Self-activity and learning	151

CHAPTER		PAGE
VIII.	MOTIVATION AND LEARNING (<i>Cont.</i>)	
	Mental set and association	152
	Interests and motivation	153
	Interests and learning	153
	Habits as drives to action	154
	Definite goals	156
	Knowledge of progress	158
	Educational tests	159
	Praise and reproof	160
	Punishment and reward	162
	Competition	164
	Motivation in relation to intelligence	165
	Habit and learning	167

PART II

THE HIGH-SCHOOL SUBJECTS

IX.	THE CURRICULUM	173
	Early education in America	173
	Educational aims and the curriculum	174
	Modernizing the curriculum	175
	The dependence of curriculum values upon pupils	176
	The dependence of curriculum values on contemporary life	177
	Psychological principles underlying the selection of subject matter	179
	Dangers of over-standardization	180
	Articulation between the elementary and secondary school	180
	Curriculum differentiation	183
	Curriculum provisions in secondary schools with different-sized enrollments	187
	The problem of transfer	188
	Some guiding principles in the organization of materials	192
	The schedule	196
	Summary	196

CHAPTER	PAGE
X. PSYCHOLOGY OF LANGUAGE—READING	199
What is language?	199
Language and psychology	202
A. Origin and function of language	203
Some earlier concepts	203
Unity in development	204
Early sign language	205
Language and thinking	207
Social environment and speech	209
Language and the individual	210
B. Reading activities	212
The nature of reading	212
Relation of reading to other subjects in the high school	212
Relation of achievement in reading to mental ability	214
Reading and study in the high school . . .	215
Reading interests and growth	220
Reading and literature	222
Native ability and literature	223
Appreciation	224
Individual differences in ability to ap- preciate	225
XI. PSYCHOLOGY OF LANGUAGE—ENGLISH	230
Various phases of English taught in different courses	230
General aim of teaching English	231
Language inventory of the pupil on entering high school	232
Vocabulary study	232
Extent of high-school student's vocabulary . .	234
Technical vocabulary	235
Spelling in the high school	237
Grammar and language	239
Learning and motivation	241
Learning and intelligence	243
Language and social pressure	246

CHAPTER		PAGE
XI.	PSYCHOLOGY OF LANGUAGE—ENGLISH (<i>Cont.</i>)	
	Errors and learning	247
	Early versus more recent methods of language work	253
	The need for individualized work	254
	The need for co-operative teaching	255
	Developing desirable attitudes toward oral and written expression	257
	Variety of elements listed under "English"	259
	Reading tests	261
	Tests in literature	262
	Spelling tests	263
	Language and grammar tests	264
	Composition tests	265
XII.	PSYCHOLOGY OF MODERN LANGUAGES AND LATIN	267
	Historical statement	267
	A. Modern languages	268
	Psychological factors involved in modern language study	269
	Interrelationship of language abilities	270
	Modern languages and educational growth	271
	Transfer value of modern languages	272
	Learning and teaching the modern languages	274
	Direct versus indirect learning	276
	Reading a modern language	278
	Vocabulary development	281
	Modern language grammar	282
	Pronunciation	284
	Mental ability and achievement	285
	Measurement and diagnosis in the modern languages	286
	B. Latin	288
	Values in the study of Latin	288
	Relation between ability in Latin and intelligence	291

CHAPTER

PAGE

XII. PSYCHOLOGY OF MODERN LANGUAGES AND LATIN
(Cont.)

Psychological factors involved in learning Latin	294
Motivation and interest in Latin	296
Latin and English	297
Vocabulary development	299
Transfer and Latin	303
Tests for measuring the results of Latin instruction	304

XIII. PSYCHOLOGY OF MATHEMATICS	307
Abstraction versus concreteness	307
Motivation of mathematics	308
Some difficulties encountered in mathematics	309
A. Algebra	310
Algebra is a mathematical science	310
Objectives in the study of algebra	312
Interests in algebra	313
Developing algebraic notions	315
Transfer value	317
Learning difficulties in algebra	318
Drill in algebra	320
Errors in algebra	322
Special disability in algebra	325
Factors of success in algebra	325
Measurement and diagnosis in algebra	328
B. Geometry	330
The meaning of geometry	330
Objectives of geometry teaching	331
The psychology of space	331
Geometry and thought	333
Pupils' interest in geometry	335
Sex differences	337
Mental processes in learning geometry	339
Measurement and diagnosis in geometry	340
XIV. PSYCHOLOGY AND THE NATURAL SCIENCES	344
What is meant by science?	344

CHAPTER	PAGE
XIV. PSYCHOLOGY AND THE NATURAL SCIENCES (<i>Cont.</i>)	
How do the sciences differ?	345
What should a study of science do for the pupil?	346
Children's interests in science	349
Language difficulties in science	352
Children enter high school lacking in elementary training	353
Difficulties of science teaching and learning in general	354
Applications of science	355
Learning and the sciences	356
The laboratory method in science	360
Correlation of science abilities	363
Science teaching and transfer	364
Provisions for individual differences in general science	365
Measuring the results of general science instruction	367
XV. PSYCHOLOGY OF PHYSICS, CHEMISTRY, AND BIOLOGY	371
The physical sciences distinguished from the biological	371
A. Physics	372
The pupil and physics	372
Factors contributing to success or failure in physics	374
Measuring the results of physics teaching	380
B. Chemistry	381
The pupil and chemistry	382
Objectives of chemistry	384
Problems in the teaching and learning of chemistry	385
Mental processes required in chemistry teaching	388
Mental processes required in studying chemistry	388

CHAPTER	PAGE
XV. PSYCHOLOGY OF PHYSICS, CHEMISTRY, AND BIOLOGY (<i>Cont.</i>)	
Sources of difficulties	390
Measuring the results of chemistry teaching	392
C. Biology	394
Contributions of biology	394
Objectives of biological teaching	396
Content of high-school biology	398
Relation between mental ability and achievement in biology	399
Learning and teaching biology	401
Measuring the results of biology instruction	402
XVI. PSYCHOLOGY OF THE SOCIAL STUDIES	406
What is history?	406
Objectives of history teaching	407
Factors influencing the learning and retention of history	408
Sex differences in history	410
Relation of learning exercises in history to local affairs and events	411
The psychology of time and history teaching	412
The development of concepts in the social sciences	415
Developmental values in history	417
Presenting historical material	419
Vocabulary	421
Reviews	422
Provisions for individual differences	423
Measurements	425
XVII. PSYCHOLOGY OF THE PRACTICAL ARTS	430
Historical note	430
Vocational development in secondary education	431
A. Home economics	434
Formation of habits	434

CHAPTER		PAGE
XVII.	PSYCHOLOGY OF THE PRACTICAL ARTS (<i>Cont.</i>)	
	Interests and applications	435
	Correlation of the different elements . . .	437
	Individual differences in home economics	438
	Correlation of home economics with other subjects	439
B.	Manual arts	441
	Manual arts and the junior-high-school age	441
	Manual arts needs	442
	Transfer of training	443
	Mechanical ability and intelligence . . .	444
	Mechanical ability and environment . . .	445
	Measuring mechanical aptitude	446
C.	Telegraphy and typing	447
	The curve of progress	447
	Some problems in learning	448
	Measurements in stenographic work . . .	450
D.	Physical education	451
	Physical education and leisure	451
	Measuring motor ability	452
	Individual differences and play activities	453
	Play and social development	454
XVIII.	PSYCHOLOGY OF THE FINE ARTS	456
A.	Music	456
	Music as an international language . . .	456
	Music as a "natural gift"	457
	The social function of music	459
	Objectives of music	459
	Elements in musical talent	460
	Measurements of musical ability	461
	Principles of learning applied to music .	463
	The importance of familiarity	464
B.	Art	464
	The fields of art	464
	The values of art	465
	Correlation with other subjects	466

CHAPTER		PAGE
XVIII.	PSYCHOLOGY OF THE FINE ARTS (<i>Cont.</i>)	
	Stability of art	467
	Individual differences in art ability	468
	Imagination and drawing	469
	Measurements in art	470

PART III

PERSONALITY DEVELOPMENT

XIX.	MEASUREMENTS IN SECONDARY EDUCATION	477
	The development of the testing movement	477
	The standardized tests	480
	Measures of achievement	481
	New-type tests	484
	Validity of new-type tests	486
	Teaching value of new-type tests	488
	Prognosis	489
	Diagnostic testing	491
	Homogeneous grouping of students	492
	General educational uses of tests	493
XX.	EDUCATIONAL GROWTH	497
	Composite growth curves	499
	Retention of subject matter	504
	The rate of forgetting	508
	Importance of reviews	510
	School attendance and mental and educational development	511
	Achievement in the elementary school compared to achievement in the high school	513
XXI.	ATTITUDES AND APPRECIATIONS	516
	The development of attitudes	517
	Importance of studying attitudes	519
	The measurement of attitudes	520
	Scientific attitudes	523
	Group consciousness	525
	Change of attitudes	527
	The development of appreciation	528

CHAPTER		PAGE
XXI.	ATTITUDES AND APPRECIATIONS (<i>Cont.</i>)	
	Appreciation and science	529
	Growth of literature appreciation	530
	The dynamics of attitudes and appreciations	531
XXII.	PROBLEM OF GUIDANCE	534
	The meaning of "guidance"	534
	Types of guidance	535
	The need of guidance in secondary schools	536
	Counseling the individual pupil	539
	Methods in educational guidance	541
	Tests and guidance	542
	The use of an interest inventory	543
	Aptitude testing	544
	The psychological examination	545
XXIII.	PSYCHOLOGY OF CHARACTER	549
	Value of character study	549
	Difficulties in character evaluation	552
	Character traits and school environment	554
	Vocabulary and literature and character	556
	Discipline and character	557
	Interests, activities, and character develop- ment	559
	Generalized summary	560
XXIV.	PERSONALITY ORGANIZATION	562
	The meaning of "personality"	562
	Measuring personality	563
	Personality traits of the gifted	568
	School success is not sufficient	570
	What is a deviated personality?	572
	Need of group participation	574
	Adjustment of capacities, interests, and apti- tudes	575
	Need for unity in development	576
APPENDIX		581
SUBJECT INDEX		587
AUTHOR INDEX		595

CHAPTER I

Application of Psychology to Secondary Education

Increasing importance of education. From 1900 to 1926 there was an increase in the public-high-school enrollment from 519,251 to 3,757,466, or 623.6 per cent.¹ In 1915, 6.7 per cent of the total school population were in four-year secondary schools; by 1920, the per cent had risen to 10.2, and by 1926, to 15.2. During recent years there has developed a recognition of the need for training the adolescent for a better and more efficient participation in the various phases of social life. Western civilization has accepted the philosophy that every child should receive such instruction as will aid him both vocationally and avocationally in his preparation for citizenship and the duties of life in general. As society grows in complexity, and especially as economic developments tend to distribute the hours of labor more equitably, the need for wise training and leadership of youth becomes greater. The importance of the future of society cannot be over-emphasized, and the present growth in the complexity of society demands that the interest in education be increased.

Concerning the point we have just made, Hullfish says: "An education that ignores the educative effects of the social life surrounding it, that ignores the character of the

¹ *Journal of the National Education Association*, 1930, Vol. 19, p. 20.

2 Application of Psychology to Education

social situation in which it finds itself, ought not to anticipate that it will be looked upon as a builder of citizens for that society.”²

According to the data presented in connection with Figure 1, 88.8 per cent of the children of the United

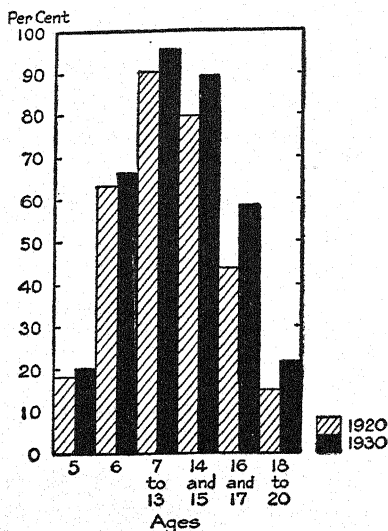


Fig. 1.—Percentage of Population Attending School in the United States, 1920 and 1930.³

States fourteen and fifteen but only 57.3 per cent of those sixteen and seventeen years old were enrolled in schools. Thus, we find that over 40 per cent of sixteen- and seventeen-year-old children are not being reached by our schools. According to the Fifteenth Census of the

² Hullfish, H. G., "The Philosophy of Education in a Changing Social Order," *Educational Administration and Supervision*, 1934, Vol. 20, p. 372.

³ *Federal Relations to Education, Part II: Basic Facts, Report of the National Advisory Committee on Education*, 1931, p. 139.

United States, 2,514,986 persons from fourteen to eighteen years of age were not enrolled in school in 1930.

Education and social dynamics. Education in its content, method, and philosophy reflects the aspirations of society as expressed by the leaders of society in that field. In order that some materials related to our present-day educational philosophy may be better understood, a word should be said regarding the psychological nature of society. There is a unity, a community of ideas, running through the thinking of mankind during any given age. This unity or thread is not a static one but a changing one. Not only is it a moving or becoming philosophy, but, what is of much greater significance, it is a becoming philosophy developing in a certain and definite direction. This is only saying that the mores, customs, traditions, points of view, and so forth, are moving in a definite direction in their fruition; and that as they are realized, society is organized in its hopes, aspirations, and attachments to values.⁴

In earlier times, our secondary schools were established mainly to serve a select group of individuals; now it is recognized that the schools have a tremendous responsibility to society at large. Not only is education looked to for the solution of the problems of social unrest and crime, but it is also expected to aid in the development of a more desirable social order and a more intelligent citizenship. The school must try to help create a high type of society for its pupils to live in, and in doing that, it is expected to accomplish more than merely make the pupils absorbers of so much subject matter from books. Education should strengthen the possibilities of person-

⁴ Garrison, S. C., "Trends in the Foundations of Teaching," *Peabody Reflector and Alumni News*, 1934, Vol. VII, p. 83.

4 Application of Psychology to Education

ality growth and should aim to prepare the pupils for greater social responsibilities.

If public education is to continue its great service to society and civilization, it must provide a range of activities and a course of study so rich in content and so broad in scope that they will fit pupils to take their places in a society far different from any known by our forefathers. The curriculum should provide such courses of study, materials, and activities as will build up integrated and well adjusted personalities. It should, therefore, provide the means by which the adjustment of the pupils to their environment can be facilitated with the greatest amount of satisfaction both to the pupils and to society. It should provide for differentiation among the school population through the recognition of individual differences in abilities, capacities, and interests. It should provide for preparatory training for the benefit of those members of the school population who should continue their education in some higher institution. It should conduct a more careful study of the secondary-school population in order that pupils may be directed into fields in harmony with their abilities and interests and the demands of our society.

Danger of over-standardization. In the development of our civilization, certain conventions and restraints have been established and become a part of our customs. They represent the consolidation of man's social achievements and should not be considered lightly. There is a danger, however, in the development of a sacrosanct attitude toward the elements of the established order. Yet, in the operation of the machinery by means of which man lives socially there must be a consistency and continuity. Toward these ends education must bend earnest efforts. The major purpose of these efforts should be the promo-

tion of a great economy in action and the furthering of helpfulness and ultimate happiness among human beings. To reduce all activity to a stereotyped form is psychologically unsound and socially undesirable. Dallas should not offer the same life elements as Boston. The difference in dialect of the typical Connecticut Yankee, the Midwesterner, and the individual from "away down South" gives picturesqueness to our national life. If the Niagara valley were lifted and the great mountain ranges were lowered until an average point was reached, our country would suffer a great æsthetic loss. No doubt, one of America's crowning glories is her great physical, social, and spiritual versatility. To train every child in the performance of the fundamental and necessary activities is a part of the function of our schools. However, we must recognize the dangers which develop as a result of the processes of indoctrination, the danger in reducing attitudes and ideals to some stereotyped form, and the danger in developing rigid personality patterns.

There must be a general mobilization of those forces that will aid in presenting an educational philosophy in harmony with our present-day civilization. The writers believe that psychology gives support to such a philosophy in the more specific application of the facts and principles it has formulated to the problems of education. This volume is an effort in this general direction focused particularly on the secondary-school period. Its purpose, as stated in the "Preface," is not so much to inform the reader about psychology and psychological facts and theories as such, as to present a more definite and clearer application of psychological principles to problems of learning and growth during the high-school period.

What is teaching? *Education* has been referred to as

6 Application of Psychology to Education

the modification or changes produced in one's ways of responding to various stimuli. *Teaching* has reference to the guidance and direction of the learner in the various learning activities. The purpose of teaching, then, is to make learning more efficient and effective. The suggestion that teaching is a matter of the guidance of the learner places the responsibility for the active mental processes involved on the learner. The teacher does not take materials from her store of experiences and give them to the learner. The teacher merely arranges conditions, organizes materials, and stimulates the student in such a way as to make learning more economical and effective.

The principle that "we learn by doing" is applicable to the learning of school materials as well as to the development of habits of motor skill. Since no one can do the learning for another, we may conclude that all learning is a result of self-activity, and that there is no education imposed from without. The teacher is merely an aid and guide, but a very essential element in a learning situation. The function of the teacher is to facilitate this self-education through guiding, directing, and stimulating the learner. The school is the environment that has been set up to provide a setting where the student can be aided with maximum effectiveness in essential learning activities.

Teaching is, thus, the art concerned with guidance and direction of students in learning situations. Teaching as an art depends to a large degree upon basic psychological principles and facts relative to the child's nature and abilities and to the nature of the learning processes.

Psychological trends. Hulin recently said:

The character of modern psychology has been determined largely by the demands of the other sciences. Physics, astronomy, and medicine have each encountered the need for

a definite knowledge of the precision of human judgments and of sensory discrimination so that the exact relations between physical changes and the corresponding events in consciousness, or between anatomical structure and sensations, could be established. The insistence of these problems turned the main course of psychological interest away from the philosophical aspects to a distinctly experimental approach.⁵

The trend of developments in the field of psychology since the World War has been toward the humanizing of its materials, laws, and principles. Instead of the great emphasis on the study of images, sensations, conscious states, reflexes, and the like, problems of human welfare and efficiency are receiving most consideration. The rapid development of materials in applied psychology is reliable evidence of this trend. With the applications of psychology to problems of industry, business, the professions, and education, one can truly say that psychology is being humanized. Until comparatively recent years, there was very little scientific work carried on in the study of educational problems. Psychology was introspective and made no attempt at an objective approach to problems of child study, measurement, and learning. This psychology was primarily interested in the study of conscious states. The investigation of the objective manifestations of behavior through controlled observations is a product of a more scientific and objective psychology. The rapid growth in the applications of objective psychology to the different phases of human experiences has been monumental, as well as being an important element in reshaping and redirecting the work in education.

Psychology defined as "the science of human behavior"

⁵Hulin, Wilbur S., *A Short History of Psychology*, New York, Henry Holt and Company, Inc., 1934, p. 72.

8 Application of Psychology to Education

enters into the scientific study of the behavior activities of man under all conditions. The relation of this to the objective approach has already been discussed. Educational psychology is that phase of the science of psychology which takes as its subject matter the science of human behavior in relation to the educational process. We shall concern ourselves primarily with those applications of scientific facts and procedures of objective psychology that relate to learning activities.

The sphere of educational psychology as it is considered in this text can probably be best grasped by reference to a list of the topics treated in the volume. Some of the main problems studied are: growth and development during the secondary-school age; adolescent interests in relation to school activities; the psychology of the curriculum; applications of psychology to the learning of the various school subjects; the problem of the correlation and articulation of educational materials; provisions for individual differences in abilities; the problem of transfer in relation to high-school subject matter; educational growth during the secondary-school period; measurements in secondary education; development of attitudes and appreciations during the secondary-school period; guidance of secondary-school pupils; and character and personality development.

The experimental method. Superior minds have probably existed at all ages and in all civilizations, but the success of modern science in the furtherance of civilization is not only a result of the accumulated ideas of great minds but also a result of a method of work that has come into wide usage. Roman and Greek scholars possessed great minds, but they were concerned in the main with the formulation of ideas and concepts (philosophizing) rather

than with experimentation and verification. They recognized many truths on the basis of observation and reflective judgment. Aristotle, for example, believed that, if two objects of equal size but unequal in weight were dropped from the same height at the same time, the heavier one would reach the ground first. This general idea, coming from the lips of a great authority, was accepted as a truth for many centuries until Galileo studied the problem by a more scientific method. He dropped two balls of the same size but unequal in weight from the leaning tower of Pisa and found that they reached the ground at the same time. This illustrates tested knowledge as opposed to knowledge based upon reflection. Modern science cannot point to any one date as its beginning, but since the great awakening of the Renaissance, man has come more and more to apply the experimental method in the attempt to arrive at more exact solutions to problem situations.

The scientific method is now applied to practically every realm of human activity. Only to the extent that this method is used in the solution of our educational problems can we be assured of progress in the educational field.

What is learning? Learning, from an educational viewpoint, might be thought of in terms of the changes produced in one's ways of responding to various situations and conditions. After the learning process has been carried out, we respond to a situation differently—probably more harmoniously or rationally than before. Every experience is an interaction between the individual and certain environmental factors. This interaction produces changes in both the individual and his environment. While we may think of learning as the changes produced

10 Application of Psychology to Education

in one's ways of responding, we may also conceive of it in terms of the physiological changes that have been produced in man's structural equipment. In learning, reactions to various stimuli are modified, and these modifications affect future activities.

During recent years the investigations in learning have included studies dealing with a wide range of ages. Baldwin, Gesell, and others have investigated learning in young children, while Thorndike and others have investigated the same problem in adults. These investigations have shown very definitely the unappreciated capacity of individuals at these extremes to learn more efficiently than they do now. The ability of infants to acquire various emotional and motor forms of behavior patterns, particular likes and dislikes, and peculiar temperamental tendencies and habits has tended to throw new light on the time-honored theory of instinctive behavior. Thorndike's studies indicate that the ability for acquiring information, ideas, and the more subtle skills reaches its maximum in the early twenties. The period from twenty to thirty is the superior one, while the decade from thirty to forty is at least equal to the span from ten to twenty. At forty-five, a man can hold his own with his son of fifteen. The period from six to sixteen or twenty is usually considered the best time of life for acquiring information and skill, but the work of Thorndike and others on adult learning shows that adults learn equally well or better up to a much later period of life.

These facts challenge very seriously the wisdom of our present educational practice of legally concentrating schooling entirely in the fewest possible years and bringing it to such an abrupt conclusion at fourteen, sixteen, or some other prescribed age.

Reflective judgment. The problem of reflection is directly related to intelligence and education. In any approach to human problems, reflective judgment should be used. Scientific facts alone will not suffice, for there are many problems that demand an immediate answer.⁶ It is in this capacity that the philosophical approach is especially valuable. Any philosophical approach should begin with the factual information at hand and by means of critical thinking evaluate such facts, and so arrive at a more accurate answer to the pending problem.

Some recent trends in scholarship. A study of recent developments within the realm of educational philosophy reveals several very noticeable trends. The first of these is the increasingly clear recognition of the ultimate aim and objective of the various types of subject matter. A second trend is the well-nigh universal interest throughout Western civilization in research as applied to every phase of life's activities. Scientific medicine, applied physics, industrial chemistry, and scientific agriculture have brought such marvelous benefits to mankind that science has come to be thought of as magic. To be scientific is thought of as most admirable. Another trend is the increasing recognition within each realm of knowledge of the indebtedness of that to related fields. This third trend is similar to a fourth which signifies a growing realization by scholars in a specialized field that their respective field of study cannot be shut off from other fields. Narrowed specialization and the increasing departmentalization of knowledge into separate compartments is not in harmony with this trend. A fifth trend in scholarship relates to the application and appraisal of knowledge. With the

⁶ Kelly, T. L., "The Scientific versus the Philosophic Approach to the Novel Problem," *Science*, 1930, Vol. 71, pp. 295-302.

12 Application of Psychology to Education

transition at work in our social economic order, the evolution of knowledge is based more and more upon its contribution to human welfare.

Knowledge useful and purposeful, verified by scientific methods, harmonized with other fields of study, and appraised in terms of human welfare represents the aim of the school as it seeks to influence the learner.

Thought Problems

1. What are some current problems that have developed as a result of the increased enrollment in our high schools?
2. List some problems in secondary education that may be attacked by the experimental method.
3. How are our present educational problems related to the socio-economic transition during the past half-century?
4. List some problems in secondary education that are more or less philosophical in nature.
5. Why are not all the problems in education studied by the experimental method?
6. Discuss the major idea presented in one of the following articles: Hullfish, "The Relation of Philosophy and Science in Education," *Journal of Educational Research*, 1929, Vol. 20, pp. 159-165; or Gates, "Contributions of Psychological Research to Education," *School and Society*, 1930, Vol. 31, pp. 485-493.

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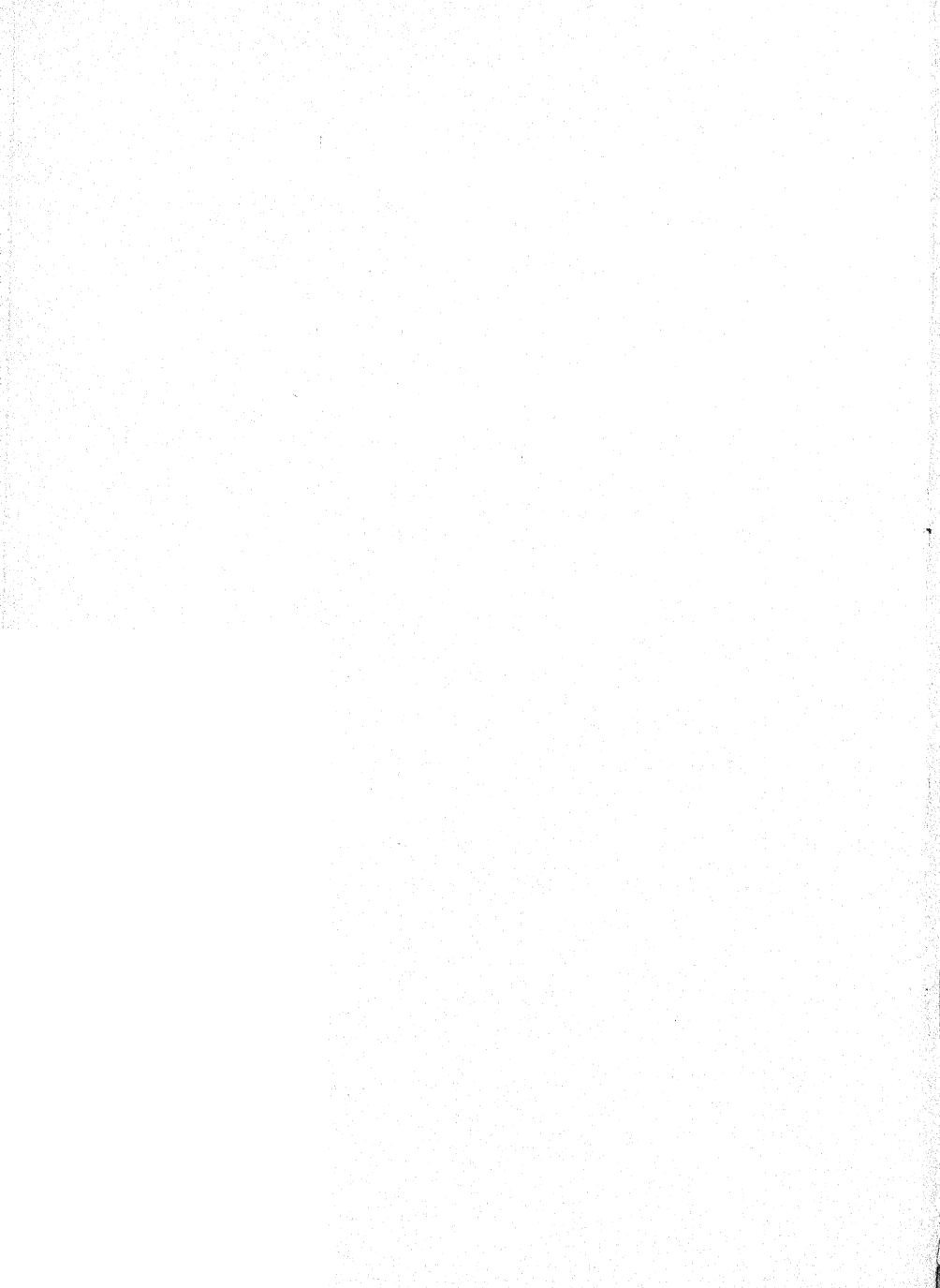
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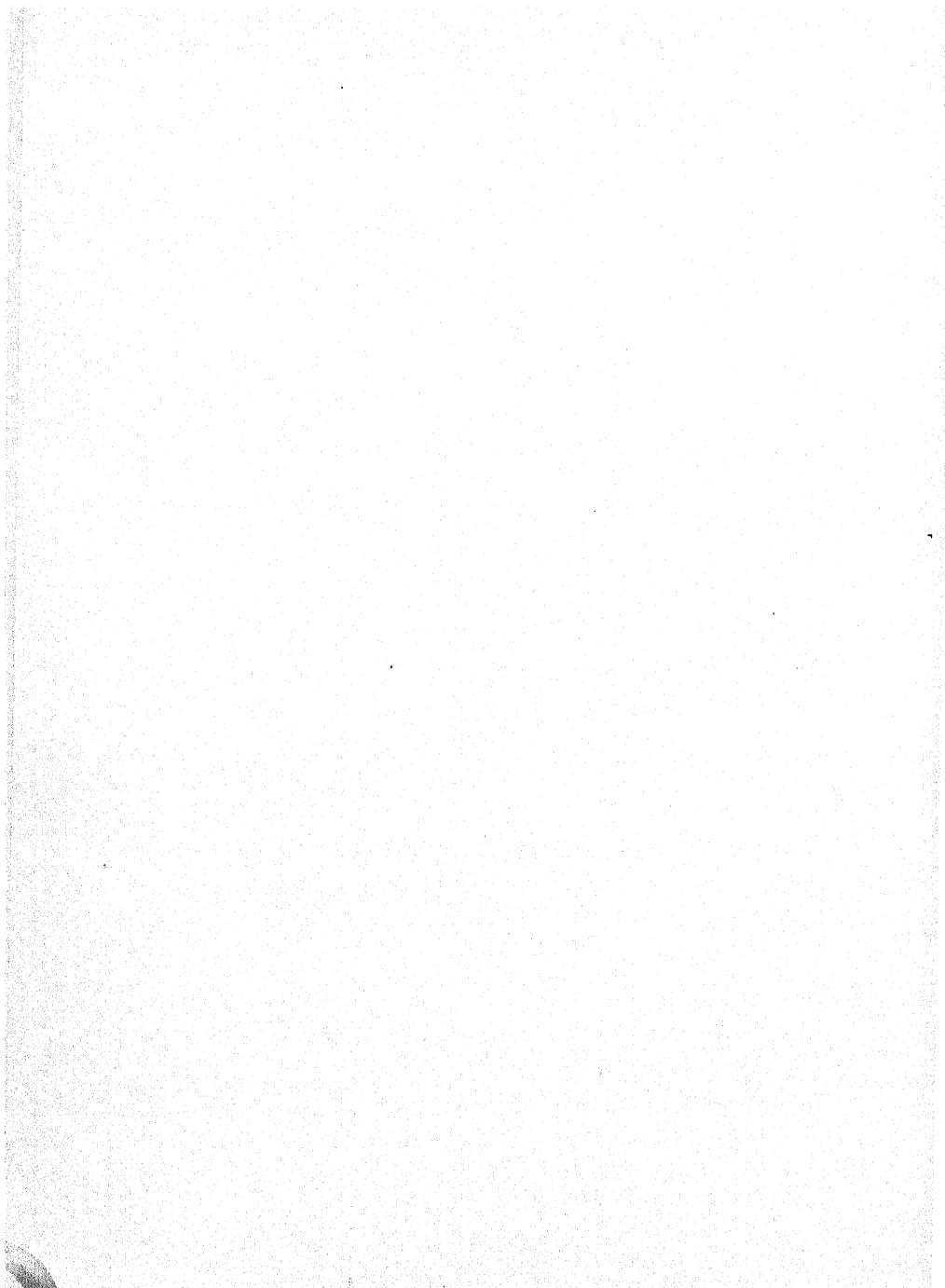
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PART I

Progress Toward Maturity



CHAPTER II

Development and the Individual

As we study boys and girls of the high-school age, we find that they are to be understood only as a product of development and as being in the process of development. It is the purpose of this chapter to discuss some of the more general concepts of development in order that the reader may secure an adequate background for what is to follow as well as a notion of the psychological point of view on which this book is based. More detailed treatments of the various phases of the subject are given in the succeeding chapters.

Importance of the developmental point of view for teachers. There are numerous reasons why it is important for persons dealing with the adolescent to become acquainted with the concept of development in psychology. Some of these are given below.

1. We are largely creatures of the present. We see persons as they appear to be and forget how they became that way. For this reason we develop a kind of static notion of individuals and overlook the fact that they are the result of changes and that they will change in the future. We are prone to study things as they are and to neglect the underlying causes for their condition.

2. Unless we possess the developmental or genetic viewpoint, we are likely to fail to differentiate between

different degrees of development, and to regard children only from the adult's perspective.

3. A better understanding of the adolescent is secured from developmental psychology, since it emphasizes not so much a description of his behavior as it is, but rather a study of the factors which have operated to produce it and the methods by which these factors have operated. Developmental psychology, then, emphasizes the fact that the individual today is a result of change, and it further emphasizes the causes and methods by which this change has been brought about.

4. A study of the development of behavior should be of great advantage to the teacher in that it can give him greater insight into the way his own personality has grown and an understanding of the methods by means of which additional desirable growth may be attained.

5. From the point of view of mental hygiene, a knowledge of developmental psychology is of especial value. It should give a notion of how the normal individual is produced through growth, what the normal individual is like in adult behavior, and, consequently, a knowledge of the methods to be used with individuals who are not, for some reason, growing in the normal way.

6. It is especially important that high-school teachers have a good knowledge of developmental psychology because they work with children who are far along in their growth. For this reason they are less likely to consider the relationship of the organization of the school, the methods of teaching, and the subject matter to growth, and are more apt to think of these aspects of teaching as having intrinsic worth.

What is meant by development? All living things live in some sort of external environment. This, because of

its nature, is always changing. Change seems to be one of the most universal laws of nature. Changes in the individual's environment influence it in many ways, and to these influences the individual reacts by modifying his own behavior. As the individual modifies or makes changes in his behavior, development takes place.

The word *development* in social usage has acquired a meaning which has a certain moral implication. The person who is not trained in psychology generally thinks of development as change and growth in certain desirable directions. Psychologically, the term merely means change or growth in adaptation to environment, without regard to the direction which is taken. Development may be change or adaptation to an environment of an undesirable type.

Life means change. The individual is continually facing the necessity of adaptation to environment for two reasons. In the first place, the organism, because of physiological processes which are always occurring, is always in a state of change; and in the second place, the external environment is always in a similar state. These changes stimulate the individual, who makes many reactions seeking adaptation. As the individual organism is successful in its reactions, we speak of development. Development, then, means change in adaptation to environment, regardless of whether this takes place in socially desirable ways.

Factors in development. The behavior of all living things depends on two factors: the internal and the external. Internal factors have reference to the hereditary constitution of the organism, while external factors refer to environmental conditions. In one sense, these factors cannot be separated. However, for purposes of study, the

influence of heredity and that of environment are often analyzed and contrasted.

How development occurs. In a former paragraph it was stated that the individual is in close touch with the environment at all times. From the moment the egg is fertilized—the beginning of the individual—until the person's death, we may say that he is always responding to stimuli. During his entire life, he is continuously in a state of adjustment to environmental stimuli. His behavior may very well be considered as composed of a series of responses to a continuous series of successive situations.

We should raise the question as to what factor or factors in the relation of the individual and his environment make for development. At present we are unable to give a complete answer to this question, and probably we will never be able to answer it as completely as we should desire. From what we know of individuals and their development, it now seems certain that they are organized through their reactions to stimuli. We frequently speak of the action of the environment upon the individual, yet we do not mean exactly what the statement implies. The individual always reacts to the stimulus. He is active toward the environment and cannot be thought of as an inert, static thing merely being impressed by its surroundings. Activity toward a situation tends to change the meaning of a situation so that it is never again the same for the individual. Not only does activity toward a situation tend to give meaning to the situation but it develops characteristic ways of behaving—habits. It thus appears that the individual is organized or developed through his reactions to stimuli. By control of the nature of the environment, the individual's reactions, and thus his development, may be controlled.

Concerning this problem as it relates to development during infancy, Gesell says:

The swiftness of development in infancy no one will be disposed to deny. The orderliness of this development is not so well recognized, but it is a fact of great significance. There are certain basic uniformities in the dynamics of development which apply to all infants, normal, abnormal, superior or inferior. There is a large system of uniformities which characterize all normal infants and keep them traveling on highly similar routes and on highly similar time tables. These uniformities are not stereotyped; they shade into small but important variations.¹

The forces of heredity and environment are constantly operating in developing similarities and variations. It is commonly known that organisms arise through some process of reproduction, and it is with reference to this process that heredity is studied. Usually, there is a striking similarity between parent and offspring; invariably, heredity at least sets limits within which, whatever the environmental conditions may be, the individual's development will be confined.

Although it is often the custom to set the individual against environment, we find upon examination that he is in intimate relation with it at every turn; in fact, we find that only by definition can we separate the individual and his environment. There is a continuous interaction between them so long as the individual survives. Any statement regarding the individual which takes account of his biological nature must emphasize this mutual relationship. It may be emphasized thus: *the individual may be conceived of as protoplasm capable of maintaining itself by responding to a changing environment; during life, many*

¹ From Gesell, Arnold, *Infancy and Human Growth*, New York, The Macmillan Company, 1928, p. 124.

of these responses become fixed or characteristic; so that we may consider an individual as a bit of protoplasm possessing more or less definite patterns of response. Or, if we desire to think of him purely in terms of action, we may say: the individual is a relational sum-total of behavior patterns developed in protoplasm in response to environment—in which statement the individual is considered neither as protoplasm nor as environment, but as the result of the reaction of the one to the other.

Empirical principles. The developments in the science of biology increased our knowledge of the mechanism by which characteristics of parents are transmitted to their offspring. Although early civilization recognized certain basic principles of heredity, a definite statement of specific laws based upon experimentation and observation did not appear until recent years. The most fundamental principle of all heredity is *like begets like*. Although in fiction and fable many exceptions to this rule seem to occur, scientific experimentation and careful observation reveal that the principle is in reality sound.

Differences in learning, in intelligence, in growth, in temperament, and in every conceivable trait are noticeable from ordinary observation. All collie puppies even from pure stock are not exactly alike. Differences are not only to be noted among dogs and other animals lower than man, but are observable in all traits in the human species as well. Such observations more carefully made give rise to another empirical principle of heredity, namely: *variations occur within the species*. With respect to these two empirical principles, Sandiford says:

Heredity to some is a mysterious force which moulds the offspring in the likeness of the parent; to others it is the antithesis of variation, that is, heredity consists in the re-

semblances and variation in the dissimilarities between progenitors and descendants. Heredity is not a force. Neither is it merely the likenesses between offspring and parents; it includes all traits both like and unlike.²

The factors responsible for the wide range of individual differences will be treated more fully later in this discussion. Various theories and interpretations have been given to explain the reason for such variations. Lamarck and his followers accounted for them on the basis of the influences of past experiences. They presented the theory of the inheritance of acquired characteristics and explained the differences existing among individuals on the basis of changes which were made in the family ancestry and transmitted to the offspring. However, evidence for such inherited changes has been, in the main, negative in nature. Darwin's explanation as presented in his *Origin of Species* (1859) is based upon the process of natural selection. This has also been referred to as the doctrine of "the survival of the fittest." Darwin claimed that this principle operated to preserve certain traits or characteristics, and that in the course of evolution pronounced changes appeared in harmony with the forces in the environment that acted as a selective agency for some characteristics. A few years after this momentous work of Darwin, Mendel presented in a summarized form the results of his well-known classic experiment with garden peas. This experiment was carried on over a period of eight years and was first published in the *Proceedings* of the Natural History Society of Brunn in 1866. The results of these studies have been presented in the form of *Mendel's Laws*.

²Sandiford, Peter, *Educational Psychology*, New York, Longmans, Green and Company, 1929, pp. 13-14.

Inheritance of acquired characters. There has been a rather widespread belief that changes produced in the organism through life's experiences are likely to be passed on through the germ plasm to the organism's offspring. This general idea is an old one, and evidence that the ancients believed it can be found in their folklore and myths. It was Lamarck (1801) who brought forth a system of logic in an attempt to present more objective evidence for such a theory. Since that time, a great deal of logic and, more recently, carefully planned experiments that relate to this theory have been presented.

Weismann³ was probably the first biologist to attack this problem in a convincing manner. The logic of his attack was of such a nature that most students of heredity accepted his theory that acquired traits are not inherited. A great number of experiments have been conducted in an attempt to supply scientific evidence for the inheritance of acquired traits. Morgan says of these experiments:

An impartial survey of all this evidence cannot fail, I think, to give the impression that the many attempts to obtain crucial evidence that somatically acquired characters produce specific changes of the same kind in the germ-cells have failed. If such effects are transmitted, and especially if these are pre-eminently adaptive ones, there is every reason to suppose that evidence of such transmission should be obtainable—in fact should be abundantly apparent to anyone making careful observations. . . . The situation is even worse when behavior patterns are considered, for all such adaptive reactions are highly complex, involving intricate nerve and muscle adjustments. It is, I venture to think, beyond the imaginative capacity of biologists, familiar with what is best known today in embryonic development and in genetics, to suggest any rational process by which such

³ Poulton, Shouland, Shipley, and Weismann, *Essays on Heredity and Kindred Subjects*, Oxford, Clarendon Press, 1891.

complexities could be carried over as a whole from the body cells to the germ-cells.⁴

The maturation hypothesis. The studies of Gesell and others lend support to the maturation hypothesis.⁵ He points out from his studies that the development of behavior patterns in the child follows an orderly genetic sequence. In a controlled experimental study, Gesell used a pair of identical twins, referred to as Twin-T and Twin-C. By means of various tests given to them when they were 46 weeks of age, he assured himself that they were identical in their mental and physical qualities. Twin-T was used as the training subject while Twin-C was the control one. Twin-T was trained in stair-climbing for twenty minutes each day for a period of six weeks. This training was begun at the age of 46 weeks; at the age of 48 weeks, she could climb the stairs quite well. Twin-C was unable to climb the stairs at the age of 52 weeks, but at the age of 53 weeks she was able to climb the stairs without any assistance and without any previous training. This ability of Twin-C in stair-climbing seems to be the result almost wholly if not wholly of maturation. Other experiments with Twin-T and Twin-C indicated the importance of maturation.

Concerning the influence of such extrinsic factors as disease and malnutrition, Gesell points out that they do not usually "inflict any drastic changes upon the forms of fundamental behavior patterns and upon the genetic order

⁴From Morgan, T. H., "The Mechanism and Laws of Heredity," in *The Foundations of Experimental Psychology* (C. Murchison, ed.), Worcester, Mass., Clark University Press, 1929, p. 6.

⁵From Gesell, Arnold, *The Guidance of Mental Growth in Infant and Child*, New York, The Macmillan Company, 1930, p. 277.

of their sequence.”⁶ This gives support to the immunity of behavior patterns not only from the influence of training but also from that of certain limited environmental obstacles.

There is an assumption on the part of some that the maturation hypothesis applies only to sensory and motor activities and would not apply to those activities involving a larger degree of mental activity. In an experiment conducted by Lois Curry Strayer,⁷ made with the same twins referred to in connection with the stair-climbing experiment, the significance of the maturity factors in relation to language development was demonstrated. Twin-T was given five weeks’ training beginning at the age of 84 weeks. Twin-C was again used as the control subject, and was given training for four weeks beginning at the age of 89 weeks. Observations were made and recorded with great care for each subject on a 24-hour basis for each of the 63 days of the entire study. Upon the basis of a quantitative treatment of these results, the experimenter says: “Not only was the training which was begun with a maturational advantage of five weeks more effective than earlier training, but the pattern of response was more mature.”

The studies relative to the mechanism of behavior development indicate very definitely that the human infant grows in motor co-ordination and language behavior in accordance with endowment as well as environment; training, therefore, cannot transcend maturation but must recognize its importance. It would, however, be improvi-

⁶ From Gesell, Arnold, *op. cit.*, p. 288.

⁷ Strayer, Lois Curry, “Language and Growth: The Relative Efficacy of Early and Deferred Language Training Studied by the Method of Co-Twin Control,” *Genetic Psychology Monographs*, 1930, Vol. VIII, No. 3.

dent to generalize too far from these findings. The vernacular can certainly not be found in the germ plasm, and the same is true for beliefs, customs, and various habit patterns. However, it is quite obvious that plasticity and development are dependent in a large measure upon the maturation of structures.

Developmental psychology and our understanding of behavior. The success of the teacher depends as much on understanding and skill in controlling the factors of development as on a knowledge of the subjects to be taught. The teacher needs to understand the psychology of development because the child's behavior is directly related to social attitudes, discipline, and other school problems as well as to problems of teaching and learning. The learning of the pupil is conditioned by factors which can be understood only when viewed from the standpoint of developmental psychology, that is, only when the child's past is taken into account.

When the pupil comes to the high school for the first time, much of his education has already occurred. His earliest experiences influenced his development in the grades, and the motives, attitudes, and habits acquired there will in turn influence his growth during his high-school career. The early experiences are important because they must be considered in all later efforts to control his behavior and learning. A good teacher not only knows the subject matter to be taught but has an understanding of the pupils as well.

The importance of the school in the life of the nation is receiving more attention than ever before. Education for selfish reasons at public expense cannot be justified, and whether or not the public will be willing to continue to carry the financial burden involved will be determined

by the ability of the schools so to develop boys and girls that they will be socially minded. If the function of the school is to develop and modify behavior, then it certainly is the duty of the teacher to try to understand the factors which make for such development.

Unity in growth. In studying how organisms develop, it is necessary to keep in mind the nature of an individual. In a former paragraph, we made the point that development takes place as individuals respond to stimuli. This development may apparently be in different directions, but we must always remember that it is in some growing individual. The chief characteristic of an organism is its "wholeness" or "unity" in action. It is important that the teacher remember this fact, because different aspects of development are emphasized by workers in different fields. The fact that teachers frequently speak of the intellectual, the psychiatrist of the emotional, the physician of the physical, and the minister of the moral and religious life of the individual gives a false notion of the individual and implies that he is composed of a number of more or less independent faculties.

For many reasons, it is hard for us to think of the growth of the individual as a unit. Each of us has his own special interest, and usually we are anxious to see others develop the same. We watch special aspects of the growth and not this alone, forgetting that the situations which stimulate the individual's development also affect his total personality.

We have received from our social inheritance a kind of mind-versus-body dualism. Owing to the fact that our language developed during a period when a dualistic philosophy dominated the thinking of the world, we find ourselves compelled to use language which carries dualistic

implications in describing behavior. Since our language is our chief vehicle in thinking, it is exceedingly difficult for us to secure a correct notion of the individual's growth.

Not only have we a language carrying dualistic implications, but the current social concept of the individual is a dualistic one. The average teacher still speaks of the development of the mind as though the latter were something apart from physiological structure. Likewise, we have those individuals who are interested in taking care of the body and who do not suppose that such care has anything to do with mental growth. Fortunately, there is a growing body of teachers who are interested in the total well-being of the pupil and, therefore, in seeing that a curriculum which will care for this total life is provided.

With so many agencies and interests attempting to influence the growth of the child in different directions, it is small wonder that the aims of education considered in their broader aspects are so seldom realized in the life of the child. Not only are there many propagandizing agencies attempting to influence the child directly for selfish reasons, but even untrained state legislative bodies are demanding that they have a voice in the matter. Not one of the agencies is allowed to map out a consistent program looking only to the best interests of the individual and society at large. This situation results in much confusion as to what the aims of education are and how they are to be attained. So we see much uncertainty and conflict of opinion between those who see education as a means for orderly, unified growth in the development of boys and girls and those who see in it an opportunity to advance some special interest.

The children of today and the citizens of the future suffer from all this confusion. The teacher with single-

ness of purpose and high ideals for the future sees clearly that the aim of education is the highest positive development of the individual, which, of course, always has reference to the social group. Development is of a positive kind when it makes for a finely integrated and unified personality.

General characteristics of development. The measurement movement in psychology has made it possible to study the growth of individuals in a quantitative way from time to time and throw considerable light on many problems which formerly could be treated only in a theoretical way. Not only has the measurement movement given us much information, but experimental biology has contributed also to the solution of many problems by showing us the relation of extrinsic and intrinsic factors to growth. While the characteristics of development may be discussed in many topics, in general they may be listed under the four treated in the following paragraphs.

a. *The convergence or epigenetic theory.* We have previously emphasized the fact that development takes place in an individual but that environmental stimuli are factors in this development. Numerous writers have emphasized the fact that development is not simply the gradual unfolding of hereditary traits nor a result wholly of the environment which impresses itself on the child and makes him a victim of his surroundings. We should never ask of any behavior trait whether it is inherited or acquired. Where children live in approximately the same environments, differences usually may be explained largely in terms of heredity. Where there are great variations in environmental circumstances, it is exceedingly difficult to determine hereditary influences on development. It should always be remembered that individuals develop

through their reactions, and that these are dependent on both the extrinsic and intrinsic factors. Freeman says of this subject:

Thus, while granting the initial major importance of genetic constitutions, one must appreciate the fact that environmental conditions are integral factors in the developmental process, and that they are, therefore, of extreme practical importance. Nature and nurture should no longer be set against each other, for either one is conceivable only in terms of the other. That is to say, heredity and environment are mutually inclusive, since innate traits are capable of development and expression only in terms of environments, and environmental influences can act only together with the genetic bases of individuality.⁸

b. *Development is continuous.* In a former paragraph it was stated that growth has reference to change. Under normal conditions this change seems to take place in a continuous fashion and at a fairly regular rate. One reason why it sometimes seems otherwise lies in the fact that we frequently are unable to observe or measure quantitatively such changes as are taking place. Another reason is to be found in the fact that we do not have measuring instruments with which we are able to detect fine quantitative differences. Still another reason why we are unable to study growth accurately arises from the fact that we do not know the relative value of growth at one period as compared with that at another. Shall growth be measured in absolute or relative terms? In many cases we are unable to answer.

From a study of the nature of the individual and his environment, we conclude that there is no reason to think that under normal conditions he will develop by spurts. However, since the individual grows only as a result of

⁸ Freeman, F. S., *Individual Differences*, New York, Henry Holt and Company, Inc., 1934, p. 142.

reaction to stimuli, it is reasonable to suppose that under abnormal environmental conditions he will not grow in a normal way.

Some typical growth curves are given in Figure 2. Of

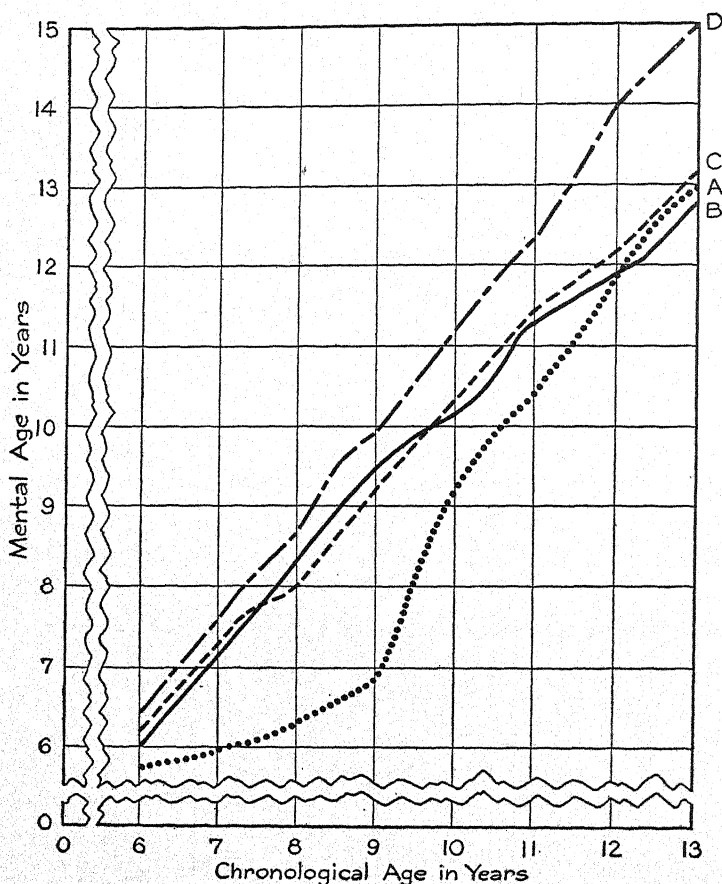


Fig. 2.—Showing Constancy of I.Q.'s. (Unpublished materials, George Peabody College Demonstration School.)

over 100 growth curves studied, 50 per cent are no more irregular than curve B. The remaining vary in irregularity from curve A to curve D. Curve A is the least regular. Some irregularity of our mental growth curves is undoubtedly due to the fact that our measuring instrument, the *Stanford Binet-Simon Intelligence Test*, is not perfect, while it is equally certain that a part of it is due to inaccurate administration of the test. It would be interesting and instructive, indeed, to know the factors which cause the large irregularities in some of the curves. Some of these irregularities are probably due to intrinsic factors, but most of them are likely due to extrinsic ones.

Curve A represents an interesting development history. When one of the writers first examined the boy whose development is represented by the curve, his home environment was about as poor as one can imagine. The family consisted of the son, the father, the mother, and two elderly aunts, sisters of the mother. The mother was a hysterical semi-invalid who because of her disposition made life miserable for both her son and her husband. The two aunts, who had no occupation and who contributed in no way to the support of the family, added nothing of a wholesome nature to the situation. The father, from point of length of service as a locomotive fireman and from his ability, as afterwards demonstrated, should have been a locomotive engineer but seemed unable to hold such a position. In addition to the bad home conditions, the neighborhood conditions were exceedingly unwholesome.

When the boy was first tested, it did not appear that he would or could ever finish the elementary school. Two years later, the mother was removed by death. The two elderly aunts then went to live with other relatives, while a sister of the father came to look after the home, which was re-established in a much better part of the city. The subsequent history of the father is interesting, but that is another story. The curve records graphically the fact that something influenced the boy's development very materially in a positive way. He later finished high school with fair success and now holds a business position requiring more

than average intelligence and character. In his case, extrinsic factors undoubtedly contributed very largely to irregularity in growth.

c. *Development is constant.* Measurements made at intervals over a period of time indicate that, on the average, development continues at about the same rate as that at which it starts. In an earlier paragraph it was stated

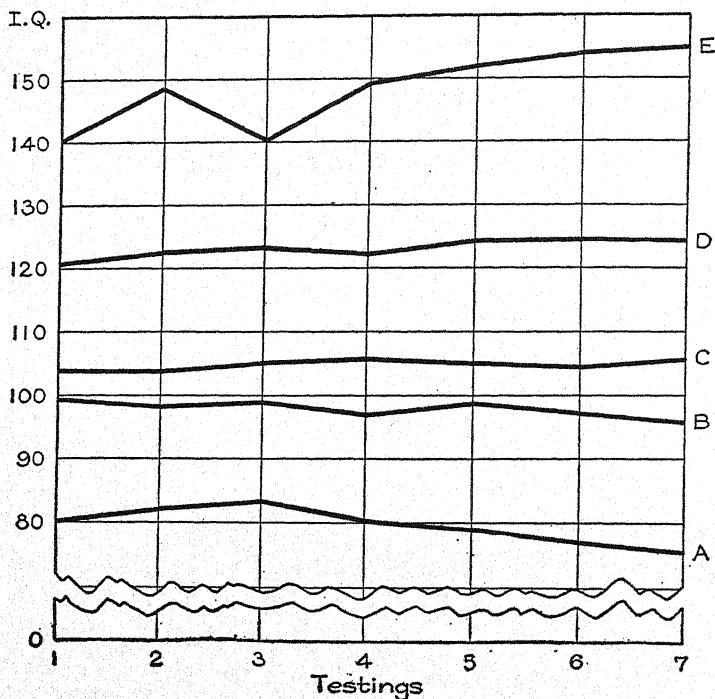


Fig. 3.—Showing Mental Growth Curves in Terms of Mental Age. (George Peabody College for Teachers.)

that, of over 100 mental growth curves, half were no more irregular than curve B. In Figure 3 are given five curves drawn from I. Q.'s secured from testings at yearly in-

tervals. An examination of the curves shows that the results secured for each individual at the several testings are fairly constant. One of the writers found that the average change in I. Q. from testing to testing at yearly intervals is a little less than 5 points.⁹ Curves drawn for physical or educational measurements also tend to show

TABLE I

RESULTS FROM RETESTS OF 468 PUPILS WITH THE "STANFORD REVISION OF THE BINET-SIMON TESTS" AFTER AN INTERVAL OF ONE YEAR. (*After Garrison.*)

	80	85	90	95	100	105	110	115	120	125	130	135	140	145	150	155
and below																
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
150	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	3
145	—	—	—	—	—	—	—	—	—	—	—	—	—	3	1	1
140	—	—	—	—	—	—	—	—	—	—	—	2	2	2	—	—
135	—	—	—	—	—	—	—	—	—	—	—	1	2	2	—	—
130	—	—	—	—	—	—	—	—	2	3	4	2	3	—	—	—
125	—	—	—	—	—	—	—	1	2	5	14	2	—	—	—	—
120	—	—	—	—	—	2	2	11	6	9	3	—	2	1	—	—
115	—	—	—	—	—	7	11	33	21	7	3	—	—	—	—	—
110	—	—	—	1	—	17	13	21	6	—	1	—	—	—	—	—
105	—	—	—	4	14	31	19	9	—	3	1	—	—	—	—	—
100	—	1	1	14	21	15	4	1	—	—	—	—	—	—	—	—
95	—	1	2	10	15	8	2	1	—	—	—	—	—	—	—	—
90	—	1	3	10	7	2	—	—	—	—	—	—	—	—	—	—
85	—	6	2	5	—	—	—	—	—	—	—	—	—	—	—	—
80	14	3	—	1	—	—	—	—	—	—	—	—	—	—	—	—
and below																

constancy in development. In general, it may be said that individuals who are superior early in the grades will be superior in the higher grades, and vice versa. It must be remembered, however, that there are exceptional cases where growth seems to be very irregular. The results of

⁹ Garrison, S. C., "Fluctuation of Intelligence Quotient," *School and Society*, 1921, Vol. 13, pp. 647-649.

two testings, separated by an interval of one year, of 468 pupils with the *Stanford Revision of the Binet-Simon Tests* are given in Table I.¹⁰

So far as the various features of physical and mental development are concerned, growth in one does not retard growth in another. This is contrary to general opin-

TABLE II

PARTIAL CORRELATIONS BETWEEN PHYSICAL TRAITS AND CHRONOLOGICAL AND MENTAL AGE. (After Baldwin.)

Traits	Constants				
	Chron. Age	Mental Age	Height	Weight	X-ray
Height-Weight.....	.57	.80			.38
Height-Chr. Age.....		.41		.52	.16
Height-Ment. Age.....	.53			.81	.59
Height-X-ray.....	.62	.73		.65	
Weight-Chr. Age.....		.66	.30		.14
Weight-Ment. Age.....	-.15		-.40		-.11
Weight-X-ray.....	.52	.76	.37		
X-ray-Chr. Age.....		.72	.62	.71	
X-ray-Ment. Age.....	.09		.04	.63	
Chr-Ment. Age.....			.47	.76	.54

ion but is substantiated by scientific evidence.¹¹ Positive, though sometimes small, correlations are usually found between measurements of physical and mental traits.

¹⁰ Garrison, S. C., "Additional Retests by Means of the Stanford Revision of the Binet-Simon Tests," *Journal of Educational Psychology*, 1922, Vol. 13, pp. 307-312.

¹¹ Baldwin, Bird T., "The Physical Growth of Children from Birth to Maturity," University of Iowa Studies, *Studies in Child Welfare*, 1920, Vol. I, No. 1; DeVoss, James C., "Specialization of the Abilities of Gifted Children," *Genetic Studies of Genius*, Palo Alto, Cal., Stanford University Press, 1925, Vol. I, Chap. XII; Doll, E. A., "Anthropometry as an Aid to Mental Diagnosis," *The Training School*, Research Department, Vineland, N. J., 1916, No. 8; Mead, C. D., "The Relation of General Intelligence to Certain Mental and Physical Traits," *Contributions to Education*, Teachers College, Columbia University, 1916, No. 76.

In Table II are given partial correlations between physical traits, chronological age, and mental age.¹² The table should be read as follows: the correlation between height

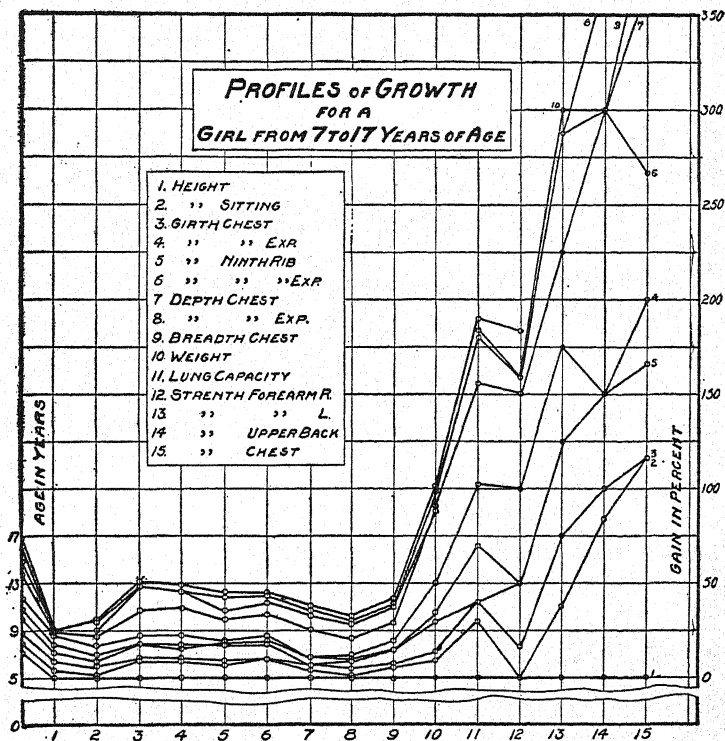


Fig. 4.—Curves of Growth Made at Intervals Between the Ages of 7 and 17 Years. (After Baldwin.)

and weight, with chronological age constant, is .57; with mental age constant, .80; and with X-ray (exposed area of carpal bones) constant, .38. An examination of the

¹² Baldwin, Bird T., and Stecher, Lorle I., "Mental Growth Curves of Normal and Superior Children," *University of Iowa Studies in Child Welfare*, 1922, Vol. II, No. 1.

table reveals the fact that in almost all cases there is a positive correlation between developmental features.

d. *Development through stimulation and action.* How far the development of sheer mental ability takes place regardless of the type of environment in which the individual lives is debatable. But it is a fact that the content of one's mental life, or one's knowledges, skills, and attitudes, is acquired, and that this depends upon stimulation. *Personality*, a term which stands for the total individual in action, is a result of native ability plus the development which this ability has attained through action in a given environment. The direction which development takes is largely a result of stimuli from without. Various aspects of personality, either socially desirable or undesirable, rather than other aspects, may develop because of the type of stimulation to which the individual is subjected.

Just as no two individuals are exactly alike, so we must not think of environment in the abstract—as a constant force. No two persons are ever stimulated in the same way by the same factors. Development is, thus, an individual matter; and while it always takes place in a social environment, yet it may take different directions in various individuals.

All development carries social obligations. Another point of view which should be stressed lies in the fact that all growth has value only as it has social worth. It is true that development takes place only in the individual members of a group, yet it is always evaluated in terms of value to the group. There is really no conflict between the idea that the school is a social institution and the corollary that individuals should be developed for the highest interests of society.

Group influences are about us from the day of our birth until our death. We could not escape these if we would. Our development is conditioned by them at every turn, and they become a part of us upon which we as individuals can exert a positive influence in accordance with our degree of development.

Thought Problems

1. What is the general meaning of the term *development* as presented in this chapter?
2. What are some environmental factors that may effect development? Illustrate.
3. Discuss the importance of the developmental viewpoint presented in this chapter as it relates to our educational philosophy.
4. In what ways does all development carry social obligations? What use should be made of this knowledge in education?
5. Why is a knowledge of the nature, rate, and amount of development important in the selection of secondary-school materials?
6. What part does maturation play in the child's acquisition of speech? Apply the maturation principle to some school activity.

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CHAPTER III

Physical Development of the High-School Pupil¹

It is very difficult to get a picture of the high-school pupil. We frequently talk about the "average" or "typical" boy or girl, but at the same time we recognize the fact that every individual is unique. However, within fairly well defined limits we can speak of the average, realizing that we are not referring to an individual standing at a fixed point in a distribution.

Physical development. Since all development is in one sense conditioned by physical growth, a study of the high-school pupil should begin with an examination of the physiological changes which take place during the high-school age. Children of the same age often vary enormously when measured with respect to any developmental feature. They vary not only with respect to measurements made at any given time but also with respect to the rate and progress of development as well. In studying the physical growth of children of the high-school ages, most writers distinguish between that associated with general increase in size and weight and that associated with physiological maturity. Beginning with the advent of puberty, there is a general increase in growth. An examination of the material in Table III reveals the

¹ Some of the materials of this chapter are taken from Garrison, K. C., *The Psychology of Adolescence*, New York, Prentice-Hall, Inc., 1934, Chap. II.

42 Physical Development of High-School Pupil

fact that there is a marked increase in the percentage of gain at those ages where normally pubescence occurs. The individual growth curves in Figure 5 also show the same thing.

In addition to the increase in height and weight, there is a general change in the proportions of various parts

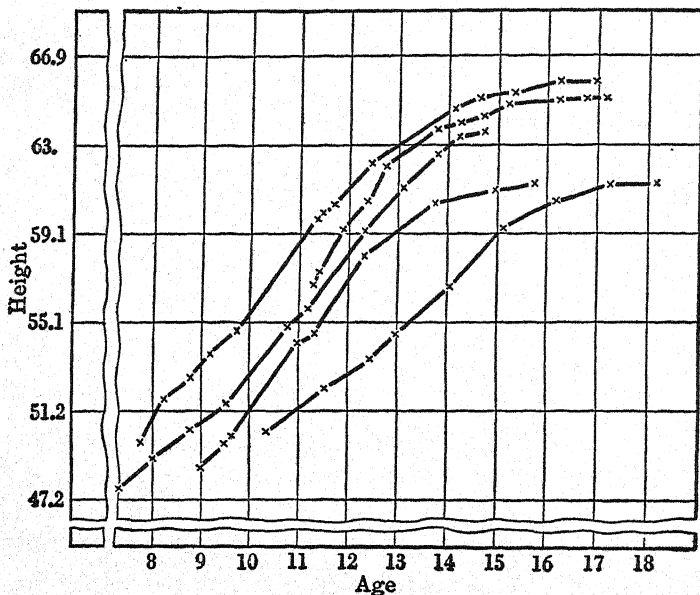


Fig. 5.—Relationship Between Age and Height and Maturation for Five Girls. (After Baldwin.)

of the body. The arms and legs change with the rate of growth of different parts of the body. The arms and legs grow in length and become firmer, while the hands and feet become larger. Other parts of the body show equally significant changes in the rate of growth. The most significant fact with respect to these growth changes is that there is wide variability among both boys and girls.

28127

Variation in pubescence. Regardless of the state of development from the physical point of view, there is no fixed age for the advent of pubescence. Neither does adolescence begin at the same age for boys or girls of normal or subnormal physical development. Studies show that at no age do as many as 40 per cent of a group become pubescent.²

In Table III are presented data from a study by Crampton³ showing the age of puberty for a group of almost 400 grammar-school and high-school boys in New York City, and figures taken from Baldwin's more recent study⁴ showing the various ages of the advent of puberty for 1,241 grammar-school and high-school girls. Now we note from Table III that the norm for pubescence is a distribution range, not an average chronological age; for into no single age-classification do a majority of the individuals of either sex fall. The data of this table indicate rather clearly, then, a wide variation in the advent of puberty. This distribution range for the girls is about one and one-half or two years advanced over that for the boys.

Terman and Baldwin⁵ offer evidence indicating that children from the upper social strata generally mature a year or two in advance of those from lower strata; their results also intimate that superior children, as a group,

² Baldwin, Bird T., "Physical Growth of Children from Birth to Maturity," *University of Iowa Studies in Child Welfare*, 1921, Vol. I, No. 1, p. 191.

³ Crampton, C. W., "Physiological Age—A Fundamental Principle," *American Physical Education Review*, 1908, Vol. 13, p. 150.

⁴ Baldwin, Bird T., "A Measuring Scale for Physical Growth and Physiological Age," *Fifteenth Yearbook of the National Society for the Study of Education*, 1916, Part 1, p. 17. Quoted by permission of the Society.

⁵ Terman, L. M., *Genetic Studies of Genius*, Palo Alto, Stanford University Press, 1925, Vol. I, p. 205; Baldwin, Bird T., "Mental Growth Curves of Normal and Superior Children," *University of Iowa Studies in Child Welfare*, 1922, Vol. II, No. 1.

44 Physical Development of High-School Pupil

mature earlier than inferior children. Other studies have shown that the feeble-minded as a group mature later. However, the age of pubescence varies not only with sex, living conditions, and general intelligence, but also with race and climate. It has been shown that south European children, children of Latin stock, mature earlier than children from the northern European countries; that colored children in America mature earlier on the average

TABLE III
APPEARANCE OF PUBESCENCE IN BOYS AND GIRLS

Boys		Girls	
<i>Ages</i>	<i>Per Cent</i>	<i>Ages</i>	<i>Per Cent</i>
12.25.....	16	10.....	0.0
12.75.....	25	10.5.....	6.25
13.25.....	26	11.0.....	0.0
14.25.....	28	12.0.....	37.93
14.75.....	24	12.5.....	23.88
15.25.....	20	13.0.....	34.88
15.75.....	10	13.5.....	37.87
16.25.....	4	14.0.....	38.46
16.75.....	4	14.5.....	17.74
17.25.....	2	15.0.....	14.54
17.75.....	0	15.5.....	7.81
		16.0.....	6.12
		16.5.....	3.17
		17.0.....	0.0

than white children of the same age; and that children from the tropical climates mature earlier as a group than those from the temperate and colder climates. There is some evidence from data gathered by Doctors Burdick and Brown that there is a difference in the age of pubescence for rural and for city boys.⁶ These studies are directly in harmony with the principle of the mutual co-operation

⁶ Baldwin, Bird T., "A Measuring Scale for Physical Growth and Physiological Age," *Fifteenth Year Book of the National Society for the Study of Education*, 1916, Part I, p. 15.

of hereditary and environmental factors in development that is emphasized throughout this study.

Methods of studying physical development. In general, three methods have been used in the study of the physical development of children. The first in point of historical and frequent use is that of studying weight-height-age relationships. For the average parent and teacher, this is the most practical method to use. A study of either weight or height alone gives very little information, because children of the same sex, age, race, and environmental conditions vary greatly. Weight is probably a less reliable measure of physical development than height; however, when individual measurements only are considered, it is the one more generally used. A child may become heavy simply as a result of fat accumulation with no real growth in the number of tissue cells. Or just the opposite may happen: he may lose weight because he is using up adipose tissue, while at the same time the number of tissue cells is increasing.

Measurements of height furnish a much more accurate index of growth because they really indicate growth in terms of the length of the skeleton. This measure is fallible, however, because the bones may be growing in thickness, the cavities may be decreasing in size, and chemical constituents are, perhaps, being very greatly altered.

Because physical measurements are easy to make, they offer great possibilities if carefully interpreted. It is questionable, however, whether they are worth a great deal in the hands of a poorly trained school nurse or nutrition worker. Their chief value lies in the fact that they are easy to make and objective, thus giving the teacher or school nurse a method of detecting extreme variations

46 Physical Development of High-School Pupil

from the norm. Such cases should always be brought to the attention of competent medical authorities.

Baldwin⁷ and others have studied physical development by means of repeated measurements. By this method Baldwin was able to plot growth curves for individuals, such as Figure 5, page 42, as well as curves for the sexes and for different groups of individuals. While this method of studying physical development is not of so much immediate practical value, when measurements are kept over a period of time, they furnish a permanent, objective picture from which the effect of various factors on development can be studied. Such measures make possible the scientific determination of how individuals grow and facilitate predictions about future growth. They also make an intelligent system of guidance feasible.

It is recognized that physical measurements do not give a reliable index to physiological and anatomical maturity. It is known that children of the same chronological age and the same size may vary greatly in their physiological and anatomical development.

A third method of studying development relates to measurements which give results possible of interpretation in terms of ages. There are two of these ages, the anatomical and the physiological. Some workers differentiate between these while others do not. *Anatomical age* has reference to the degree of physical development which a child has attained. It represents the point he has attained in his development toward physical maturity or adulthood. It does not have reference to size, weight, health, or strength. *Physiological age* is a term which has

⁷Baldwin, Bird T., "The Physical Growth of Children from Birth to Maturity," *University of Iowa Studies in Child Welfare*, 1921, Vol. I, No. 1.

been largely used in connection with the development of the reproductive powers. In general, three physiological ages are spoken of: the pre-pubescent, the pubescent, and the post-pubescent.

The anatomical and physiological ages have been determined in various ways. The eruption of the permanent teeth has been used by a number of workers.⁸ Crampton⁹ and others have called attention to the fact that the onset of puberty is a good index of anatomical development. Baldwin,¹⁰ following the lead of earlier workers, used X-ray photographs of the surface areas of the carpal bones in the wrist. This seems to be the most reliable measure, since it is based on the degree of the development of the skeleton, which is fundamental to all physical growth.

Growth in height and weight. Returning again to Baldwin's individual growth curves, Figure 5, it will be seen that there is a relationship between height and age of pubescence. As a rule, the taller girls mature first. From other material in the same source, it appears that pubescent acceleration in weight precedes pubescent height acceleration. Baldwin concludes:

Height and weight, therefore, it would appear, offer excellent objective criteria for teachers and parents for determining the advent of menstruation as a factor in pubescent development and the onset of maturity. If the girl is tall, healthy, and well nourished, this physical stage may be reached as early as 11 years in a normal girl; if tall, but under weight, it may be delayed; if very short and markedly light, it may be delayed until 16 years of age.

⁸ From Bean, R. B., "The Eruption of the Teeth as a Physiological Standard for Testing Development," *The Pedagogical Seminary*, 1914, Vol. 21, pp. 596-614.

⁹ Crampton, C. W., "Anatomical or Pedagogical Age Versus Chronological Ages," *The Pedagogical Seminary*, 1908, Vol. 15, pp. 230-237.

¹⁰ Baldwin, Bird T., "Physical Growth of Children from Birth to Maturity," *University of Iowa Studies in Child Welfare*, Vol. I, 1921, No. 1.

48 Physical Development of High-School Pupil

These conditions have wide educational application both in physical training and school work. They emphasize the fact that the smaller child should be treated as a younger person who has not had the physical development and the accompanying mental disturbances and experiences which would seem to be indicated by her chronological age in years and which, too often, has been used as a basis of classification, training, and social activities.¹¹

Measurements of a group of thirteen-year-old boys are given in the first part of Table IV.¹² These pupils were all completing the seventh grade when measured and were scattered through the several sections of the grade. In these sections were found pupils from eleven to sixteen years of age. The lower half of the table gives measurements on the first fifteen boys of the grade taken alphabetically with the thirteen-year-olds excluded. This table gives a typical picture of conditions, so far as physical measurements are concerned, of the usual seventh grade. It should be stated, however, that these pupils are, on the average, superior. This fact is seen when the average for the group is compared with standard norms and is also revealed by the fact that the average I. Q. for the group is 113.

The data in Table V show a general falling off in the growth in height of boys at the ages of eleven and twelve, followed by an increase in height growth that reaches its maximum at the ages of fourteen and fifteen. The height curve for the girls is similar to that for the boys, except that the decline occurs at an earlier age and the adolescent spurt in growth reaches its maximum at the ages of twelve and thirteen. The preadolescent decline and the adoles-

¹¹ Baldwin, Bird T., *Physical Growth and School Progress*, United States Bureau of Education, Bulletin No. 10, 1914, pp. 67-68.

¹² Unpublished materials, Jesup Psychology Laboratory, George Peabody College.

TABLE IV

CERTAIN PHYSICAL MEASUREMENTS MADE OF A GROUP OF THIRTEEN-YEAR-OLD SEVENTH-GRADE BOYS

<i>Pupil</i>	<i>Age</i>	<i>Weight (Pounds)</i>	<i>Height (Inches)</i>	<i>Lung Capacity (Cubic Inches)</i>	<i>Strength of Grip (Pounds)</i>
	<i>Yr. Mo.</i>				
1.....	13— 9	80.7	56.8	138	27
2.....	13— 7	97.4	62.5	150	26
3.....	13— 2	101.4	64.5	193	36
4.....	13— 4	96.	60.	160	28
5.....	13— 7	99.2	60.4	153	29
6.....	13—11	104.5	61.2	188	27
7.....	13— 3	82.3	58.1	150	21
8.....	13—11	131.3	65.	232	44
9.....	13— 2	141.	68.7	278	48
10.....	13— 0	106.5	63.	200	35
11.....	13—10	134.5	68.5	247	42
12.....	13— 7	97.	60.7	198	27
13.....	13— 1	106.	61.4	172	41
14.....	13—10	86.3	59.	155	22
15.....	13— 2	84.	57.5	146	27
	<i>Yr. Mo.</i>				
16.....	12— 9	91.8	61.5	180	25
17.....	12—10	89.	57.5	140	23
18.....	14— 6	95.	59.3	154	23
19.....	11— 4	85.5	57.2	137	22
20.....	12— 7	91.3	62.	197	33
21.....	15— 3	144.6	68.3	302	47
22.....	14— 2	97.1	60.2	143	38
23.....	15— 5	99.4	50.1	125	31
24.....	14— 7	112.3	64.2	201	38
25.....	12— 7	91.5	59.5	159	28
26.....	11— 8	89.4	58.4	139	27
27.....	14— 9	71.	53.8	117	25
28.....	11— 6	86.3	59.2	159	27
29.....	11—11	108.	58.8	144	33
30.....	14—11	126.5	66.5	169	42

50 Physical Development of High-School Pupil

TABLE V

AVERAGE HEIGHT IN INCHES OF BOYS AND GIRLS OF DIFFERENT AGES¹³

Age at Nearest Birthday	Boys			Girls		
	I	II	Average Annual Increase	I	II	Average Annual Increase
8.....	48.6	49.8	1.9	48.5	49.1	2.1
9.....	50.7	51.5	1.9	50.5	51.1	2.0
10.....	52.6	53.5	1.95	52.5	53.1	2.0
11.....	54.3	55.3	1.75	54.5	55.3	2.1
12.....	56.2	56.9	1.75	57.0	57.6	2.4
13.....	58.0	59.3	2.1	59.3	60.1	2.4
14.....	60.3	61.8	2.4	61.1	61.8	1.75
15.....	62.9	64.1	2.45	62.5	62.7	1.15
16.....	64.6	66.7	2.15	63.3	63.6	.85

TABLE VI

AVERAGE WEIGHT IN POUNDS OF BOYS AND GIRLS OF DIFFERENT AGES¹⁴

Age at Nearest Birthday	Boys			Girls		
	I	II	Average Annual Increase	I	II	Average Annual Increase
8.....	54.5	55.3	4.4	52.4	53.8	4.95
9.....	59.6	60.7	5.25	58.0	59.7	5.75
10.....	65.2	67.2	6.05	64.0	67.2	6.75
11.....	71.1	73.1	5.9	70.3	74.1	6.6
12.....	78.0	77.7	5.55	79.7	83.9	9.6
13.....	85.1	88.4	8.9	89.7	96.2	11.35
14.....	95.4	98.3	10.1	99.4	107.2	10.35
15.....	108.4	109.4	12.05	107.6	115.5	8.25
16.....	116.7	120.6	9.75	113.6	120.6	5.55

cent spurt are very noticeable in the data. In the case of weight, a similar condition prevails. The peak of growth for boys is reached at their fifteenth year, while the peak for the girls is reached at their thirteenth year. The

¹³ Column I represents data from Bird T. Baldwin's studies. Column II represents data from *United States Public Health Reports*, May, 1922, Vol. 37, No. 20.

¹⁴ Column I represents data from Bird T. Baldwin's studies. Column II represents data from *United States Public Health Reports*, May, 1922, Vol. 37, No. 20.

average annual increase represents the increase during the year preceding. Thus, the increase of 4.4 inches for eight-year-old boys is the average increase between the seventh and eighth years of life.

These curves present some evidence that height and weight changes are closely related to the beginning of puberty, the spurt of growth for girls being, on the average, earlier by one or two years than for boys. Owing to various environmental influences, the individual growth curves for height are less variable than those for weight. However, it might be stated as a general principle that, up to the onset of adolescence, development has proceeded rather rapidly and with fair uniformity, and that this development might further be considered as quantitative in nature. Even educational growth has been rather gradual and constant. In this country the average child who has entered school at six years of age will, if he makes normal progress, reach junior high school at the age of twelve or thirteen.

Anatomical development. Anatomical development pertains primarily to the skeletal system and especially to changes in the structure of the bones. With the advent of adolescence, as has been pointed out, there is an increase in height and weight. But there is a further change in the composition of the bones (in the osseous and cartilaginous materials, and so forth) as the individual matures. The ossification of the bones proceeds gradually, but is rather far advanced at the beginning of adolescence. Girls of all ages from five or six to maturity show a larger area of ossification.

Prescott gives a rather complete account of the studies dealing with anatomical measurements by means of radiographs. From these he concludes:

A consideration of the literature to date does not establish or discredit the value of radiographs as a means of determining anatomical age or the value of anatomical age for what it can tell of the child's development. Rotch apparently established the fact that the development of the carpal bones is an index of general anatomical development by his study of over 1,000 children. This study included radiographs of many other parts of the body, all made with care, and appears to have been broad enough to justify Rotch's conclusions despite the apparent differences between the two hands found by Long and Caldwell. This is the more likely because Pryour, Bardeen and Baldwin each states definitely that bilateral differences are not great enough to be important and the present study has found the same to be true. . . . No study has been made of the extent to which general physiological development parallels anatomical development. It seems to have been taken for granted that changes in the body structures are accompanied by the necessary adjustments of the organs.¹⁵

The child's age at the time of the eruption of the permanent teeth has been used as an indicator of anatomical development. Dental records have been obtained from studies of the growth of children conducted under the direction of Dearborn at Harvard University.¹⁶ Cattell has presented these data in the form of a dental-age scale, there being one scale for measuring the dental age of boys and a different one for girls. These scales are based on the total number of permanent teeth which have broken through the gums at different ages, and standards were established for 7,835 children of north European descent. Figure 6 shows the variation in time of the eruption of permanent teeth for the different age levels. Notably,

¹⁵ Prescott, D. A., "The Determination of Anatomical Age in School Children and its Relation to Mental Development," *Studies in Educational Psychology and Educational Measurement, Harvard Monographs in Education*, 1923, Series 1, No. 5.

¹⁶ Cattell, Psyche, "A Scale for Measuring Dental Age," *School and Society*, 1928, Vol. 27, pp. 52-56.

sex differences are rather clearly shown, and the pre-adolescence of both boys and girls is marked by a period of accelerated eruption of the permanent teeth.

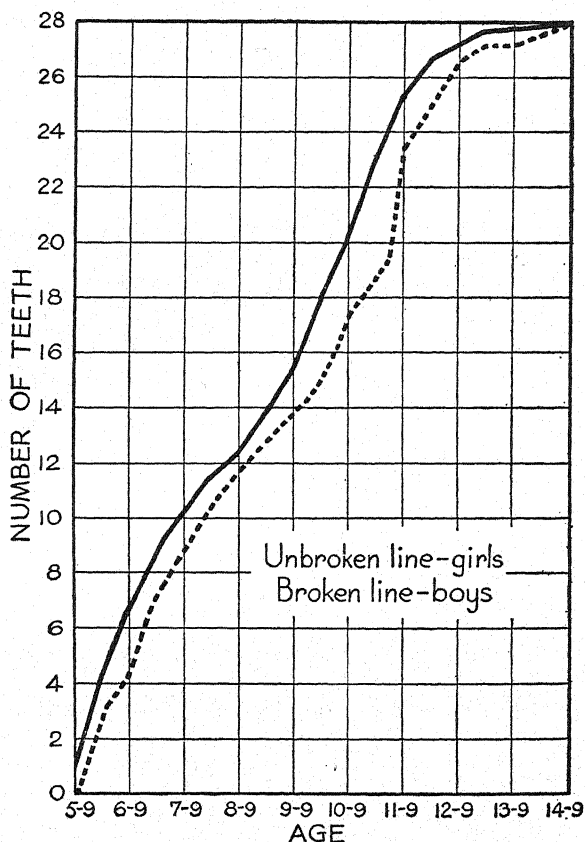


Fig. 6.—Dental Growth Curves for Boys and Girls. (After Psyche Cattell.)

Lack of uniformity in growth. That there is a great lack of uniformity in the general development of the various parts of the body is especially in evidence as we examine the rate of growth of some of the more important

organs. Thus, the brain of the child weighs, at birth, a little less than one pound. By the time the child is eight years of age, his brain is about as large as it will ever be; but insofar as the inner cellular structure is concerned, growth and maturation are yet quite incomplete. The cortical centers controlling voluntary behavior mature subsequently, and certain medullation processes appear to be still later in maturing—this being especially true of some cellular structures of the cerebrum related to mental life.

However, aside from the growth and maturation of the sex powers, there is no growth and maturation so pronounced as that of the circulatory system. At birth the heart is relatively heavy, and it grows rather rapidly during the first six years; but after this period, growth is rather slow. In this connection Tyler says: "During the next seven years, between the ages of seven and fourteen, its increase is still slower, adding about two-thirds of its volume at seven. During puberty the heart enlarges as much as during the preceding seven years."¹⁷

The effect of this retardation of growth in the circulatory system is doubtless more to be considered than most parents and teachers realize. During the preadolescent stage the arteries are more developed than the heart, so that the heart is probably less efficient in propelling blood through the body, hence the frequent fatigue and breathing affections of the individual.

A further lack of uniformity in growth is present in the development of lung capacity. Measurements made on groups of school children show that the increase of lung capacity is quite pronounced during the adolescent period.

¹⁷ From Tyler, John M., *Growth and Education*, New York, The Macmillan Company, 1907, p. 82.

The greatest increase for girls occurs between the ages of ten or eleven and fourteen, the greatest for boys from one to two years later. Furthermore, Bolton¹⁸ refers to studies by Smedley and by Leslie I. Reed in support of the idea that vital capacity is considerably affected by the extent to which one engages in physical exercises. Baldwin's researches show that the physical curves for the development of lung capacity are quite similar to those for the development of weight and height in that they indicate a preadolescent retardation followed by an increased adolescent growth. Concerning sex differences, he says:

The girls as a group show a smaller breathing capacity than do the boys. The girls reach their periods of cessation of growth before the boys. The boys' curves show more concavity during the pre-adolescent age than do those of the girls, and the general shape of the curve differs.¹⁹

Another important change experienced during adolescence is that of muscular growth. At the age of eight the muscles constitute slightly over one-fourth the body weight (27.2 per cent), while by sixteen muscular growth has come to constitute 44.2 per cent. By the time boys have reached the age of sixteen, their strength of grip has become practically double that which they had at the age of eleven; but, although this growth continues for a number of years, there is little further growth per year following the development into maturity. Tests for strength of arm, strength of back, tapping, endurance, and the like all reveal that there is a great acceleration with the

¹⁸ From Bolton, F. E., *Adolescent Education*, New York, The Macmillan Company, 1931, p. 62.

¹⁹ Baldwin, Bird T., "The Physical Growth of Children from Birth to Maturity," *University of Iowa Studies in Child Welfare*, 1921, p. 79.

56 Physical Development of High-School Pupil

onset of adolescence; thus, one would expect such a development to begin earlier with girls than with boys.

That there is an unevenness in growth from birth to maturity is verified by all studies in this particular field. The unevenness was early noted by Hall, who drew a descriptive picture of the adult as he would be if the various parts of his body had grown proportionally from birth to maturity. He writes:

The skull and face would be enormous, the neck long, the shoulders low or almost absent, the thorax narrow laterally but deep from front to back like that of a quadruped, the arms and especially the legs short, the hips small and feeble.²⁰

Physical growth resulting from exercise. The growth of a muscle as the result of repeated exercise is a matter commonly recognized, but common knowledge is not sufficient evidence for the acceptance of facts. The problem of whether "growth through activity" really occurs was studied in an experiment conducted by Morpurgo²¹ in 1897. This experiment was so carefully performed that physiologists have accepted the general conclusions almost without question. In this experiment, two dogs were used as subjects. A long, slender muscle was taken from one thigh of each animal and examined microscopically. After the animals had completely recovered from this operation, they were trained in running a treadmill. After twenty days of training, the larger dog was running the equivalent of from 40 to 50 miles per day, and was allowed to continue to run this amount for a period of 40 days. Then the long,

²⁰ Hall, G. Stanley, *Adolescence*, New York, D. Appleton-Century Company, Inc., 1904, Vol. I, p. 60.

²¹ Morpurgo, B., "Ueber Activit tis—Hypertrophie der will K rlichen Muskeln," *Arch. Path. Anat.*, 1897, Vol. 150, pp. 522-554.

slender muscle, equivalent to the one removed from the one thigh, was removed from the other. Microscopic examination and measurement showed that the much-exercised muscle was fifty per cent larger in cross section than the unexercised muscle.

The slender fibers in the muscle were approximately the same in number for the exercised and unexercised muscles, but in the much-exercised muscles they were much better developed. The developing effect was not confined wholly to muscles, but was most marked in them. This development resulting from exercise is especially different from development resulting from maturation in that in the latter case there is a multiplication of cells.

There is other evidence of a less scientific nature in support of the findings that the muscles grow in size as a result of activity. The "athletic heart" has been referred to, and this condition represents an enlargement of the muscular wall of the heart caused by a constant overexercising of the muscles involved. The deterioration of the muscle through disuse is well known to anyone who has observed a sick patient who has not exercised his muscles for some time.

The evidence for the growth of the nervous system through exercise is not so clear from the standpoint of common knowledge, but there is some scientific evidence which indicates that such growth occurs. White rats were used as subjects by Donaldson²² in an experiment in which this problem was attacked. The rats were taken at the age of one month and divided into an experimental (exercised) group and a control group. The rats of the

²² Donaldson, H. H., "On the Influence of Exercise on the Weight of the Central Nervous System of the Albino Rat," *Journal of Comparative Neurology*, 1911, Vol. 21, pp. 129-137.

58 Physical Development of High-School Pupil

experimental group were placed in cages with rotating wheels, in which they ran a great deal of the time. When the animals reached the age of seven or eight months, the brains of the exercised rats were compared for weight with the brains of the rats of the control group. It was found that the brain of the exercised animal was in most cases heavier than that of the control. The average difference was 2.5 per cent in favor of the exercised group.

TABLE VII

MEAN CORRELATIONS BETWEEN CERTAIN PHYSICAL TRAITS FOR AGES THIRTEEN TO FIFTEEN. (*Baldwin, 1920.*)

	<i>Boys</i>	<i>Girls</i>
Height—weight.....	.821	.618
“ —breathing capacity.....	.776	.716
“ —sitting height.....	.902	.892
“ —chest girth.....	.671	.426
“ —strength of right arm.....	.607	.504
“ — “ “ left “.....	.593	.416
“ — “ “ upper back.....	.513	.546
Weight—breathing capacity.....	.764	.489
“ —sitting height.....	.804	.622
“ —chest girth.....	.883	.892
“ —strength of right arm.....	.715	.562
“ — “ “ left “.....	.668	.441
“ — “ “ upper back.....	.654	.462
Breathing capacity—sitting height.....	.787	.691
“ “ —chest girth.....	.722	.507
“ “ —strength of right arm.....	.642	.400
“ “ — “ “ left “.....	.633	.366
“ “ — “ “ upper back.....	.567	.417
Strength of right and left arm.....	.830	.829

Interrelation of traits. Coefficients of correlation obtained between various measurements indicate that physical growth is very complex. And while correlations indicate that individuals superior in one developmental trait are likely to be superior in others, the degree of relationship varies considerably for different combinations of such traits. Furthermore, correlations are not uniform

for different age levels, although these are strikingly similar for the sexes, as is shown in Table VII.

Baldwin and Wellman's²³ recent study of eleven physical traits revealed that the most highly uniform relationships for both boys and girls were between weight and width of hips and between standing and sitting height. Baldwin's early studies gave ample evidence that some physical traits are closely and positively related to others, but that no single trait could be selected as one by means of which all developmental traits could be predicted. These correlations for boys and girls thirteen, fourteen, and fifteen years of age reveal the relationships existing between the various physical measurements of groups within the same chronological age level. Other studies tend to corroborate Baldwin's results.

Referring to other studies that have been made, Wellman says:

A high or moderately high degree of relation between total carpal area and height, weight, width of shoulder, and width of hips was found by Baldwin, Busby, and Garside for ages ten to sixteen for boys, and eight to twelve for girls. Correlations of $.562 \pm .067$ and $.467 \pm .10$ between age of maturing and ossification ratio for girls at fourteen and fifteen years are reported by Abernethy. At sixteen and seventeen years the correlations were $.093 \pm .10$ and $.240 \pm .11$. Abernethy did not find a marked correlation between ossification ratio and height.²⁴

Thought Problems

1. What are some of the erroneous conceptions commonly held concerning the nature of child development?

²³ From Wellman, Beth L., "Physical Growth and Motor Development and Their Relation to Mental Development in Children," *A Handbook of Child Psychology* (C. Murchison, ed.), Worcester, Mass., Clark University Press, 1931, p. 246.

²⁴ From Wellman, Beth L., *op. cit.*, p. 246.

60 Physical Development of High-School Pupil

2. Cite some uses that can well be made of the measurements of a group of students in junior high school. What measures would you obtain?

3. What are the different methods used in the study of physical development? Give the advantages of each.

4. If they are available, study some data on physical development secured from a group of students, and note the variations existing. How do these variations relate to their interests? To their personalities?

5. In your observations, have you detected in yourself a spurt in growth with the onset of adolescence? What other pronounced changes occurred rather rapidly?

6. What is the significance of the lack of uniformity in growth discussed on pages 53 to 56?

Selected References

Baldwin, Bird T., "The Physical Growth of Children from Birth to Maturity," *University of Iowa Studies in Child Welfare*, 1921, Vol. I.

Bolton, F. E., *Adolescent Education*, New York, The Macmillan Company, 1931, Chaps. II and III.

Brooks, F. D., *The Psychology of Adolescence*, Boston, Houghton Mifflin Company, 1929, Chaps. II and III.

Eldridge Seba, *The Organization of Life*, New York, The Thomas Y. Crowell Company, 1925, Chap. I.

Garrison, K. C., *The Psychology of Adolescence*, New York, Prentice-Hall, Inc., 1934, Chap. II.

Sommerville, R. C., "Physical, Motor and Sensory Traits," *Archives of Psychology*, 1924, No. 75.

For a good summary of studies on mental and physical development, see: "American Educational Research Association," *Review of Educational Research*, Vol. III, April, 1933.

CHAPTER IV

Mental Development of the High-School Pupil¹

In the discussion of *mentality* in this chapter, we are using the term as synonymous with *intelligence*. Both terms are somewhat vague, since they were not technical ones to begin with. Psychologists have attempted during the last three decades, especially during the last one, to endow these words with a more definite meaning. As it has been recognized, they were in general use when the psychologist first began studying growth in a scientific way. For this reason it has been very difficult to give them a limited and exact meaning.

What is Meant by the Terms Mental Ability and Intelligence?

Many writers have suggested definitions of intelligence, but these definitions have not always been in close agreement, since psychologists view intelligence from different angles and since the concepts to which each holds reflect the particular emphasis of his trend of thought. In general, however, notions of the individual and his mental ability are becoming more biological.

¹ Some of the materials from this chapter are taken from Garrison, K. C., *The Psychology of Adolescence*, New York, Prentice-Hall, Inc., 1934, Chap. III.

62 Mental Development of High-School Pupil

A number of definitions presented in *The Foundations of Experimental Psychology*² are:

Intelligence is the ability to adjust oneself to new situations, making the proper use of one's thinking capacity.—STERN.

It is the power of readjustment to relatively novel situations by organizing new psychophysical combinations.—BURT.

It is a group of innate capacities by virtue of which the individual is capable of learning in a greater or less degree in terms of the amount of these innate capacities with which he is endowed.—COLVIN.

An individual is intelligent in proportion as he is able to carry on abstract thinking.—TERMAN.

Intelligence involves two factors—the capacity for knowledge and the knowledge possessed.—HENMON.

Intelligence seems to be a biological mechanism by which the effects of a complexity of stimuli are brought together and given a somewhat unified effect in behavior.—PETERSON.

With respect to the various definitions and generalizations about intelligence, perhaps the most important controversies have centered around the theories of Thorndike and Spearman. Spearman considers intelligence a general ability, the "education of relations and correlates."³ Thorndike's view has been referred to as a "multiple-factor" theory and that of Spearman as the "two-factor" theory.⁴

However, our interest in the nature of intelligence is not concerned with the finer distinctions set forth as to its

² From Pintner, Rudolph, "The Individual in School: I, General Ability," *The Foundations of Experimental Psychology* (C. Murchison, ed.), Worcester, Mass., Clark University Press, 1929, p. 686.

³ Spearman, C., *The Nature of Intelligence and the Principles of Cognition*, New York, The Macmillan Company, 1923.

⁴ Thorndike, E. L., "Intelligence and its Measurement: A Symposium," *Journal of Educational Psychology*, 1927, Vol. 12, pp. 124-127.

exact nature; we are concerned here with the nature of mental growth and with the additional fact that nature has been partial in the mental endowment of individuals. The discussions here will center on a working concept of traits commonly considered as belonging to or closely related to man's intelligence. Most writers in this field appear to agree on the following general characteristics of intelligence:

1. Intelligence is principally innate.
2. Intelligence is closely related to learning and thinking.
3. Intelligence grows and develops with maturity.
4. Intelligence is concerned more with abstractions and generalizations than with concrete sensory experiences.

Concerning the relation between intelligence and learning, Peterson says: "It is undoubtedly true that degree of intelligence is somewhat closely related both to the rate and to the limit of learning, especially when higher forms of learning are concerned. Learning is adaptation to external conditions, and intelligence is certainly to be judged in considerable measure by the nature of such adaptation. But a wholesale identification of learning ability with intelligence is confusing, to say the least. . . ." Again, in referring to the close relation of ideational learning, as it pertains to perception, and discrimination to intelligence, he says: "That person is most intelligent who, with a given amount of experience and maturity, is most apt to perceive significant relations and to react discriminately to them as distinct from the numerous irrelevant elements in the situations met." ⁵

⁵ Peterson, Joseph, "Intelligence and Learning," *Psychological Review*, 1922, Vol. 29, pp. 375 and 388.

64 Mental Development of High-School Pupil

Studies in which the factor of intelligence was examined in relation to transfer show for the brighter pupils a greater amount of transfer. Overman⁶ studied transfer in relation to intelligence and the instructional method. His results show that transfer increases with the intelligence level, and that the brighter children excel most during the use of those instructional methods which permit them to generalize and make comparisons.

Physical basis of mentality. Intelligence is not to be conceived of as something apart from the structure and function of the various parts of the body. Peterson's "biological mechanism by which the effects of a complexity of stimuli are brought together and given a somewhat unified effect in behavior" emphasizes several important features of intelligence. In the first place, intelligence is a biological mechanism; that is, we must think of it as the ability of an individual to function. This ability implies a finely made and co-ordinated structure together with the co-ordination elements, the nervous system. The statement further stresses the unity of the individual in response, a unity which is maintained by the co-ordinating structures. The physical basis of mentality is, then, not to be regarded as neurones, or muscles, or glands. Our measures of physical development are far from perfect. It is possible to measure some of the grosser features very accurately, but these probably have little relation to the development of finer structures and their relationships, on which mentality so largely depends.

The data presented in Table VIII show that physiologically accelerated boys and girls on the average are also

⁶ Overman, J. R., "An Experimental Study of Certain Factors Affecting Transfer of Training in Arithmetic," *Educational Psychology Monographs*, Baltimore, Warwick and York, 1931, No. 29.

accelerated mentally.⁷ These data were secured from a group of boys and a group of girls. Each group was divided into two groups on the basis of general physical development. There were then four groups, one of physiologically accelerated boys and a similar group composed of girls, and likewise two groups of physiologically retarded

TABLE VIII

MEAN MENTAL AGE IN MONTHS OF PHYSIOLOGICALLY ACCELERATED AND RETARDED BOYS AND GIRLS. (*After Baldwin and Stecher.*)

<i>Chronological Age</i>	<i>Boys</i>		<i>Girls</i>	
	<i>Accelerated</i>	<i>Retarded</i>	<i>Accelerated</i>	<i>Retarded</i>
5.....	72.0	62.8	74.4	57.6
6.....	89.4	83.2	81.3	79.0
7.....	101.3	97.1	99.9	95.0
8.....	118.2	110.8	114.6	107.0
9.....	131.1	120.3	128.6	119.1
10.....	142.4	131.0	141.1	131.0
11.....	155.3	137.6	151.2	144.3
12.....	171.1	150.1	176.7	168.2
13.....	179.0	158.4	(182.5)	189.2
14.....	194.2	166.2	194.9	183.7

pupils, one composed of boys and one of girls. An examination of the table shows that the mean mental age of the physiologically accelerated age group is higher in every case except one, the thirteen-year-old girls, than the mean mental age of the retarded.

The fact that the physiologically more mature student is generally mentally more mature also and vice versa has already been referred to. The studies have shown that pubescence is preceded or accompanied by a fairly rapid rise of the mental and physical growth curves. In a recent

⁷ Baldwin, Bird T., and Stecher, Lorle I., "Mental Growth Curves of Normal and Superior Children," *University of Iowa Studies in Child Welfare*, 1922, Vol. II, p. 55.

66 Mental Development of High-School Pupil

study,⁸ attention was called to the fact that those who mature late profit by a rapid spurt in growth similar to that of those who mature early. It appears that the effect of the spurt in the two groups is largely equal by the time adult life is reached. It seems, then, that prediction regarding the mental development of the high-school pupil must take into account physiological maturity and the factor of pubescence.

Mentality and mental content. It is necessary to distinguish, as most persons do not, between mental ability, or intelligence, on the one hand and mental content, or knowledge, on the other. *Mentality* as native endowment merely refers to the inherited ability to learn or to adjust one's self to one's environment. The degree of mentality that one possesses is measured by the complexity of environment to which he is able to adjust himself as compared with other individuals of like age.

Mental content refers to all the knowledge and skills which an individual has acquired. It is thus seen that the content of mentality depends on the environment in which one lives. The things with which we come in contact determine our mental life. This is a fact of tremendous importance in education and guidance. It is doubtful whether any of us yet realize the true significance of it. Certainly, we have not used it to any great degree in either education or guidance.

Measuring mental development. This topic is not treated fully here because it is thought better to give a more detailed study of the subject in connection with the chapter "Measurements in Secondary Education." Only

⁸ Viteles, Morris S., "The Influence of Age of Pubescence upon the Physical and Mental Status of Normal School Students," *Journal of Educational Psychology*, 1929, Vol. 20, pp. 360-368.

two aspects are presented. First, mental development may be measured in terms of mental content, that is, in terms of how well the individual has learned those things which all members of his age and educational and social group have had opportunity to learn. Most group intelligence tests really measure the individual's achievement. Second, mental development may be measured by the setting of tasks which require learning or adaptation to relatively new situations. *Peterson's Rational Learning Test* is a good example of tests designed to measure learning ability.⁹

One of the problems which has received much consideration relates to the rate of growth. The fact that we have no absolute scale for measuring mental growth complicates the teacher's situation. Different tests give dissimilar growth curves. Growth in mental ability must not be confused with growth in mental content. The thirty-year-old person may not have any greater mental ability than the sixteen- or twenty-year-old, but certainly, on the average, he has a much greater range of information. It is recognized that our mental growth curves are influenced by the fact that our measures are, to at least a certain degree, measures of mental content.

Mental growth curves are influenced not only by the type of intelligence test used but by the units in terms of which the curves are plotted as well. If growth in mental age is plotted against chronological age, a straight line will be the result provided that (1) the test scores are derived from an unselected group of persons, (2) the test results are not influenced by training more at certain ages than at others, and (3) the degree of brightness of the persons

⁹ Peterson, Joseph, "Experiments in Rational Learning," *Psychological Review*, 1918, Vol. 25, pp. 443-467.

68 Mental Development of High-School Pupil

tested on the average remains constant. It must be recognized that months and years represent units of time, and not necessarily similar units of growth, for in a given individual the rate of growth will be different at different periods in his life. After studying the age curves derived from many different tests, Freeman¹⁰ concludes that mental growth curves approximate a straight line, especially

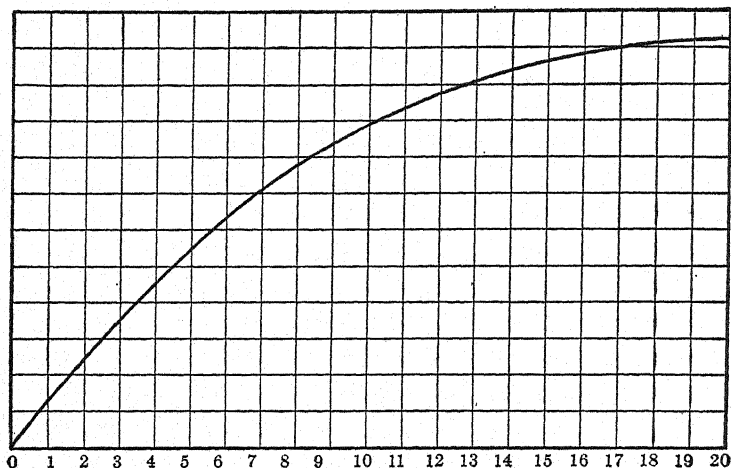


Fig. 7.—The General Nature of the Relation of Mental Development to Age in the Years 0 to 20. (From Thorndike's "Measurement of Intelligence.")

ally during the school period. This has constantly been interpreted to mean that growth proceeds at a constant rate from year to year.

A logical as well as general interpretation of the nature of mental growth gives a curve of the type presented in Figure 7, which is offered by Thorndike. If this is the

¹⁰ Freeman, F. N., *Mental Tests*, Boston, Houghton Mifflin Company, 1926.

correct interpretation of the nature of the rate of mental growth, the conclusion to be drawn is that increments become smaller and smaller with age. Now one would expect these increments to be related to and dependent upon the development of the brain and the nervous system. However, there appears to be a growth in the inner cellular structure of the nervous system. Such growth and changes in the nervous system present during adolescence are probably functional in nature—although this does not imply that there are no organic changes taking place. It is quite likely that the cellular development in the nervous system enables the mental processes to function more effectively.

Another mental characteristic of special interest to those concerned with the direction of the learning of high-school pupils is the age of mental maturity. In the consideration of this problem, the difference between mental content and mental growth must be kept in mind; the fact that mental ability must be measured on the basis of the ability to perform tasks of a mental nature makes it imperative that such tasks do not involve much previous educational experience. Mental growth does seem to proceed rather rapidly during the early years of life, even up to the early "teen" years, when, according to Thorndike's analysis of H. E. Jones's data,¹¹ there is a slow increase up to the age of twenty. Whether the later slow increase is an increase in actual mental ability or one in mental content is a matter of controversy. However, it is quite likely that many extraneous factors reduce the accuracy of the rates and limits derived for mental growth at any given period.

¹¹ Thorndike, E. L., *et al.*, *Adult Learning*, New York, The Macmillan Company, 1928.

70 Mental Development of High-School Pupil

Constancy of mental growth. An analysis of individual curves of mental growth shows that they tend to continue in the direction in which they begin, although there are some variations from year to year. This general uniformity and continuity of growth has been studied by the correlation method. The relative constancy of the I. Q. as found by Baldwin and Stecher¹² through the correlation method gave correlations ranging from .74 to .94 for various groups. Garrison¹³ finds a correlation of .83 for 42 cases on the Stanford Revision of the Binet test after an interval of three years. Terman offers a correlation of .60 or .81 (depending upon the method used) on retests of gifted children after a six-year interval. He concludes:

Making due allowances for complicating factors in measuring I. Q. constancy, one can hardly avoid the conclusion that there are individual children in our gifted group who have shown very marked changes in I. Q. Some of these changes have been in the direction of I. Q. increase, others of them in the direction of decrease. The important fact which seems to have been definitely established is that there sometimes occur genuine changes in the rate of intellectual growth which cannot be accounted for on the basis of general health, educational opportunity, or other environmental influences.¹⁴

However, the exact effect of the environmental factors upon the constancy of the I. Q. has not been adequately determined. The studies of adopted children referred to in Chapter V indicate that the size of the I. Q. may be

¹² Baldwin and Stecher, "Additional Data from Consecutive Stanford Binet Tests," *Journal of Educational Psychology*, 1922, Vol. 16, pp. 556-560.

¹³ Garrison, S. C., "Additional Retests by Means of the Stanford Revision of the Binet-Simon Tests," *Journal of Educational Psychology*, 1922, Vol. 13, pp. 307-312.

¹⁴ Terman, L. M., et al., *Genetic Studies of Genius*, Palo Alto, Stanford University Press, 1930, Vol. III, p. 477.

affected by the type of environment represented in the foster home. After reviewing a number of investigations dealing with this problem, Freeman concludes:

In terms of the amount of change in I. Q. practically all investigations agree in finding that about fifty per cent of the cases will vary by five points or less in either direction from the original quotient. They show, further, that the chances that the I. Q. will vary by ten points are about one in five; that it will vary by fifteen points, the chances are about one in twenty. Furthermore—although there is not complete agreement on all the points—it seems that no special influence on changes is exerted by the chronological ages of the subjects or by sex membership.¹⁵

Pubescence and mental growth. Some evidence has been advanced indicating that pubescence is preceded or accompanied by a fairly rapid rise of both the mental and the physical growth curves. Abernethy's study¹⁶ indicates that high-school girls who matured between ten and one-half and eleven and one-half years were superior in their schoolwork to girls who matured four or five years later. The median I. Q.'s of the two groups studied were approximately the same, 114 for those maturing early and 112 for those maturing late. However, Viteles rather clearly points out from his study¹⁷ that those who mature late profit by a rapid spurt, so that those maturing early and those maturing late are nearly equal by the time adult life is reached. Apparently, then, pubescence has vastly more significance as a physiological change affect-

¹⁵ Freeman, F. S., *Individual Differences*, New York, Henry Holt and Company, Inc., 1934, pp. 245-246.

¹⁶ Abernethy, Ethel M., "Correlations in Physical and Mental Growth," *Journal of Educational Psychology*, 1925, Vol. 16, pp. 438-466 and 539-546.

¹⁷ Viteles, Morris S., "The Influence of Age of Pubescence upon the Physical and Mental Status of Normal School Students," *Journal of Educational Psychology*, 1929, Vol. 20, pp. 360-368.

ing various glandular secretions—especially those relating to sexual characteristics—and the rate of growth in height, weight, and other physical measurements than it has as a criterion for mental growth. Physical and emotional changes are much more closely related to the onset of puberty than are the more specific mental abilities.

Gesell concludes:

The nervous system, among all the organs of the body, manifests a high degree of autonomy, in spite of its great impressionability. . . . *It tends to grow in obedience to the inborn determiners, whether saddled with handicap or favored with opportunity.* For some such biological reason, the general course of mental maturation is only slightly perturbed by the precocious onset of pubescence.¹⁸

Intelligence and age of mental maturity. It is very probable that the period of mental maturity varies for different individuals. Kuhlmann and others maintain that the mentally inferior child usually reaches mental maturity earlier than the average or superior one. Freeman, however, summarizes experimental data to show that mental maturity is reached at approximately the same time for groups of different mental ability.¹⁹

The more extended mental development found in many studies among children of superior intelligence is probably a result of the nature of the instruments used for measuring intelligence. Children who are alert and continue to make progress in the intellectual activities of the school quite likely do develop superior intellectual habits. They are, therefore, at a decided advantage in performances of an abstract intellectual nature over the child who doesn't

¹⁸ Gesell, Arnold, "Precocious Puberty and Mental Maturation," in "Nature and Nurture: Their Influence upon Intelligence," *Twenty-Seventh Yearbook of the National Society for the Study of Education*, 1928, Part 1, pp. 408-409. Quoted by permission of the Society.

¹⁹ Freeman, F. N., *op. cit.*, pp. 347-348.

succeed so well in the development of habits of an intellectual nature. There is evidence that inferior children placed in superior environments will tend to increase their I. Q. This evidence is directly related to the problem of intelligence and mental maturity. The theoretical mental growth curves for superior, average, and inferior chil-

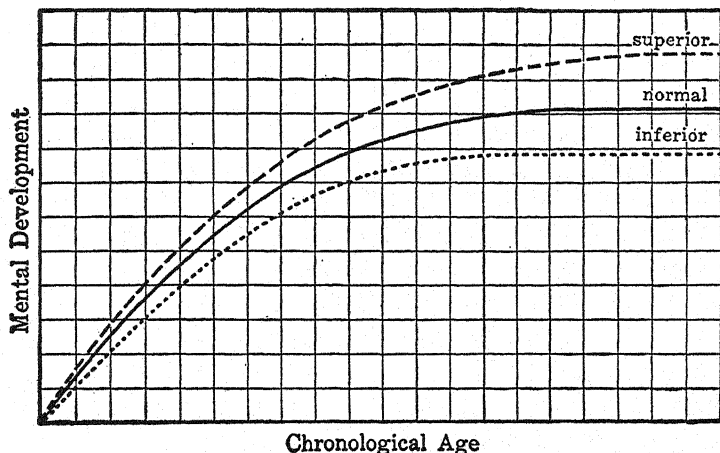


Fig. 8.—Theoretical Mental Growth Curves.

dren presented in Figure 8 are probably typical of the results appearing in ordinary situations.

Maturity in logical memory. Some educators have referred to the age of childhood as the “golden age for memory.” There are several reasons why such a misconception has developed. In the first place, a great deal of the child’s earlier mental activities consist of mechanical performances of remembering well-nigh meaningless materials; in these, the child does compare fairly favorably with adults. Again, children have not developed a wide range of logical association; therefore, they are forced to

74 Mental Development of High-School Pupil

rely largely upon mechanical memories, and in turn are not distracted by meaningful elements that a situation may suggest. Further, children often spend a great deal of time and go through a great deal of drill in memorizing certain materials. This fact adults often overlook in making comparisons. In logical memory ability there is a rather constant and gradual increase with age.

Pyle²⁰ gave the *Marble Statue Test* to 2,730 persons ranging in age from eight years to maturity. His results are presented in Table IX. An analysis of these data shows a rather steady improvement until the thirteenth year, and a definite gain in the case of the adult group.

TABLE IX

SCORES BY AGE AND SEX ON THE "MARBLE STATUE TEST." (After Pyle.)

Sex	Age	8	9	10	11	12	13	14	15	16	17	18	Adult
Male													
	No. of												
	Cases	102	148	142	149	156	163	129	89	60	45	32	65
	Aver. . .	24.3	28.7	30.0	32.9	35.1	36.8	36.1	35.5	34.4	34.6	36.9	38.3
Female													
	No. of												
	Cases	89	158	138	156	191	164	146	99	94	81	48	86
	Aver. . .	28.5	31.0	33.5	36.4	38.1	38.5	39.0	39.1	37.3	36.6	37.8	40.1

Educational implications. The problem of mental maturity and the divergence in mental ability with increase in age is highly important for a further understanding of problems in secondary education. If there is an increase in individual differences with age, the high-school teacher is confronted with the task of providing for an increased heterogeneity of her high-school population. The increasing difficulty of materials to be found as one advances

²⁰ Pyle, W. H., *The Psychology of Learning*, Baltimore, Warwick and York, 1928, p. 147.

through the grades would help to develop a more heterogeneous school population.

Educational materials and techniques should be adjusted to the widely differentiated abilities of the maturing adolescents. This is one of the foremost problems of education today—a problem that strikes at the very heart of our standardized curriculum, which has been built without a full recognition of the nature and amount of individual differences.

Relationship between mental and physical development. In the preceding chapter, it was pointed out that individuals who are superior in one aspect of physical growth are more than likely to be superior in others, although, to be sure, the correlations between some traits are not very high, indicating that there are many exceptions to the association of physical growth in one direction with physical growth in some other direction. The questions with which we are here concerned are: What is the relation between mental and physical development? And, more specifically, is the child superior in physical development likely to be superior mentally? Also, is the child who is slow in general physical development more than likely to be slow in mental development? And are some physical traits associated with growth while others are not?

The correlation between mental age and the carpal area of the bones has been studied by various investigators, and Baldwin, alone and with Stecher, has found correlations ranging from .58 to .87 between these traits of development.²¹ However, these correlations show little relationship when the factor of age is statistically controlled.

²¹ Baldwin, Bird T., "The Relation Between Mental and Physical Growth," *Journal of Educational Psychology*, 1922, Vol. 13, pp. 193-203.

76 Mental Development of High-School Pupil

Wellman's²² summary of the various studies related to this problem did not indicate that there was a close relation between mental development and such measures of physical development as: width of chest, lung capacity, ossification ratio, weight, height, grip, and the like.

Physique and intelligence. There is a rather widespread belief that intelligence can be predicted rather well from special physical features. This notion is by no means new, although the difficulty of such a prediction is clearly stated by Shakespeare in the following quotation from *Macbeth*:

There is no art to find the mind's construction in the face.

Except for idiots and special types of defectives, such as hypercephalics, cretins, and microcephalics, there is little to differentiate the mentally deficient individual from the average. Furthermore, anthropometric measurements made in the early part of the present century by Karl Pearson²³ in England and by C. Rose²⁴ in Germany indicate rather definitely that there is no significant relation between physiognomy and intelligence. Studies show that the estimate usually made by a group of students, teachers, or psychologists is only slightly superior to an estimate that could be made on a roulette wheel where the conditions were arranged according to a pure chance relation.

Burks and Tolman²⁵ recently approached the problem

²² Wellman, Beth L., *op. cit.*, p. 265.

²³ Pearson, Karl, "Relationship of Intelligence to Size and Shape of the Head and Other Mental and Physical Characters," *Biometrika*, 1906, Vol. V, pp. 105-146.

²⁴ Rose, C., "Beiträge zur Europäischen Rassenkunde," *Archiv für Rassen- und Gesellschafts-Biologie*, 1905, Vol. II, pp. 689-798; 1906, Vol. V, pp. 42-134.

²⁵ From Burks, B. S., and Tolman, R. S., "Is a Mental Resemblance Related to Physical Resemblance in Sibling Pairs?" *Journal of Genetic Psychology*, 1932, Vol. 11, p. 1.

differently by selecting pairs of brothers or sisters who were rated by several persons for their similarity in physical appearance. Their study included 141 pairs of white, English-speaking, like-sexed siblings from elementary and high schools. Correlations obtained between the intelligence quotients and resemblance ratings of the subjects revealed no evidence of a linkage between intelligence and general appearance.

Summary. This survey of some of the more important findings concerning mental growth demonstrates that many prevalent notions of the nature of mental growth and its special characteristics during the adolescent period are very much exaggerated. Since pubescence occurs in different individuals at different times, predictions and generalizations in individual cases are likely to be very inaccurate. There is positive proof of the growth and maturation of intelligence, and individual growth curves reveal that differences in the rate and amount of growth exist; there is also some evidence that dull children reach maturity earlier than average and bright children. The negative evidence concerning the association of mental and physical characteristics is developing a changed attitude toward the mentality of special physical types. The evidence that mental growth during adolescence is not different in its general manifestations from growth during any earlier period of life points out that adolescence is not a period set apart from other periods, but rather one of the continuance of child growth in which maturation is being neared. On the basis of these findings, then, schools and various organizations interested in adolescent boys and girls need not look upon them with fear or interrogation; each subject should be thought of in terms of his past development and present status.

78 Mental Development of High-School Pupil

Thought Problems

1. Look up several definitions of intelligence and compare them with those given in this chapter.
2. To what extent is mental development related to the age of pubescence? To physical maturity?
3. What do the various experiments appear to indicate relative to intelligence? What are the various correlations that have been obtained?
4. How is mental ability related to learning? How should this relation affect the curriculum prior to adolescence?
5. How would you account for the relation between mental and physical development? What is the educational significance of this relation?
6. What mental expansion in yourself took place as you reached high-school years?

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For a good summary of studies on mental and physical development, see: American Educational Research Association, "Mental and Physical Development," *Review of Educational Research*, Vol. III, April, 1933.

CHAPTER V

Individual Differences

From the earliest time, people have been conscious of the individual differences that exist among them. These differences were noticeable wherever people came together in numbers. However, about the only knowledge man possessed concerning individual variations was that differences did exist. Some of the early philosophers believed in supernatural interferences as a causal factor producing differences between people. Many theories were presented in an attempt to explain the differences in the activities of the geniuses and the feeble-minded. There was, however, no definite knowledge of the causes of these differences. Peterson states that Achilles is described in the *Iliad* of Homer as lionhearted, swift-footed, and godlike; Ulysses, as fertile in resources; Esau, as being born "red all over like a hairy garment"; Jacob, as a smooth man; and so on.¹ Therefore, we conclude that early man recognized different qualities and abilities among people.

The distribution of individual differences. The measurement of an unselected group of individuals will give a distribution according to a *normal* probability curve. A study of Figure 9 will show the general nature of such a curve. This figure presents a distribution of such a nature that there is an equal number of persons at an equal distance above and below the median or mean. For example,

¹ Peterson, Joseph, *Early Conceptions and Tests of Intelligence*, Yonkers-on-Hudson, N. Y., World Book Company, 1925, p. 18.

if we were to measure the standing height of one hundred thousand white men selected at random and to plot the results, we would find a normal frequency distribution. In the first group, we would find a few very short men, while at the opposite extreme there would be approximately the same number of very tall men. As we continue to progress from either extreme toward the average, we are likely to find progressively more and more men

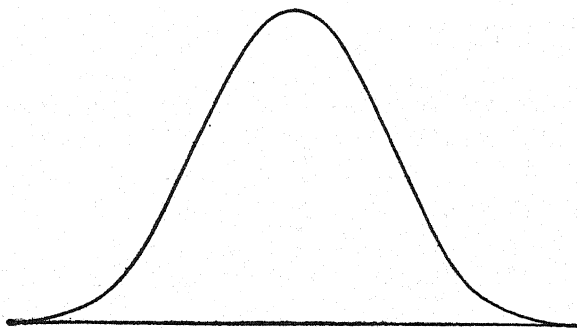


Fig. 9.—Normal Probability Curve Illustrating the Range of Trait Measures.

appearing in each group. In the medium group is the greatest number of cases. Table X shows the heights of 8,585 men taken to the nearest inch.² If these data are plotted, a curve quite similar to that of Figure 9 will be obtained. The symmetry so characteristic of the normal probability curve is, in the main, present.

Individual variations in the normal probability curve are continuous. There is no sharp dividing line between the various units. Divisions commonly made are arbitrarily set, and there are always a great number of border-

² Yule, G. U., *An Introduction to the Theory of Statistics*, London, Charles Griffin and Company, Ltd., 1917, p. 88.

line cases. One of the most impressive results of measurements is the demonstration of so wide a range of differences. These facts present a rather serious problem for the high-school teacher, and they are constantly receiving more attention in the attempt to understand individual capacities.

TABLE X
SHOWING THE FREQUENCY DISTRIBUTION FOR
ADULT MALES BORN IN GREAT BRITAIN.
(After Galton.)

<i>Height in Inches</i>	<i>Frequency</i>
57.....	2
58.....	4
59.....	14
60.....	41
61.....	83
62.....	169
63.....	394
64.....	669
65.....	990
66.....	1223
67.....	1329
68.....	1230
69.....	1063
70.....	646
71.....	392
72.....	202
73.....	79
74.....	32
75.....	16
76.....	5
77.....	2
Total.....	8585

Distribution of abilities in school. In any school system, there will be found a wide distribution of educational abilities. It has already been pointed out that individuals vary widely in any measurable capacity. A study of the distribution of educational abilities should consider the following factors: (1) the range of scores, (2) the over-

lapping of scores for the various grades, (3) the general nature of the distribution, and (4) the central tendencies for the various grades. Educational scores of students from the various activities of the junior-and-senior high school are presented in the latter part of this chapter. A study of these scores will reveal a wide range of scores in each grade. There is an enormous overlapping from grade to grade; yet in terms of the median scores, there is a rather constant progression. These data are more or less typical for the large groups in school systems throughout the country. Every alert teacher recognizes this wide variation in abilities and uses various means of providing for the educational needs of the varying groups. A discussion of the range of individual differences, along with further data, will be presented at a later point in this chapter.

Individual differences in intelligence. It has already been suggested that individual differences have always existed and have probably been recognized for many centuries. Furthermore, in the preceding discussion it was pointed out that these differences cover a wide range, although the great majority of people tend to cluster around some common average. The intelligence of an unselected group will when plotted tend to present a frequency curve of the nature of the one presented in Figure 9. Individual differences in mental ability are as great as if not greater than differences for any other trait or ability. The range is from the most helpless idiot to the great genius who is able to deal in the abstract with the new elements of life and from them extract laws, develop principles, and formulate a philosophy.

How much the differences in environment, apart from specific training or practice on tests themselves, influence

the scores on our intelligence tests has been very much debated. At the one extreme there are workers who regard the tests as measures uninfluenced by any environmental forces. At the other extreme there are those who believe that any slight change in the environment of a child will increase or decrease his score. If an intelligence test offers a sampling of stimuli to which the child responds, then these responses are to be rated as good, medium, or poor. The assumption underlying such a procedure is that the background of the child to be rated, that is, his environment and training, is somewhat comparable to the background of those with whom he is compared. Our intelligence ratings become valid to the extent that these environments offer similar average advantages in aiding the child on the test.

Wheeler's study³ with mountain children presents an interesting distribution of I. Q.'s. This distribution is shown in Figure 10. The median I. Q.'s are considerably lower than the average, but one cannot conclude that these children are thus so inferior in intelligence. The environmental handicap, the lack of equal language and school opportunities, must be considered in such evaluation.

Mental inferiority. The constancy of mental growth was discussed on page 70. It was pointed out there that mental growth is rather constant and that a developmental item at one age is a good index for predicting the developmental item at a later stage. That is, development is progressive and coherent to the extent that one can improve future predictions considerably by basing them on the behavior items now appearing in the child's life. Con-

³ Wheeler, L. R., "Distribution of I. Q.'s of 1,047 Mountain Children on the Dearborn and Illinois Intelligence Tests," *Journal of Educational Psychology*, 1932, Vol. 23, pp. 351-370.

cerning the early recognition of mental inferiority, Gesell⁴ points out that pronounced cases can be discovered soon

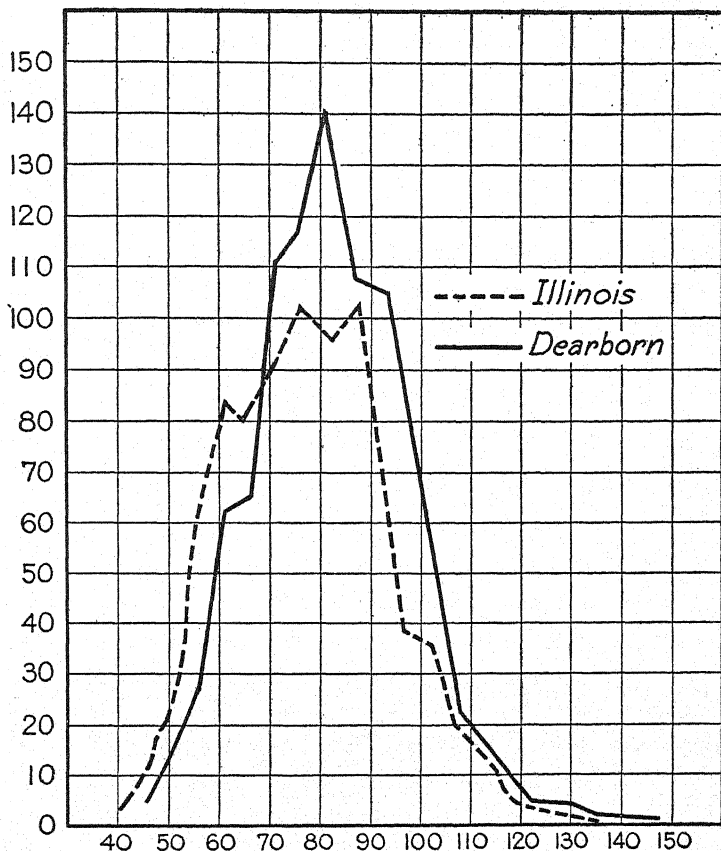


Fig. 10.—Distribution of I.Q.'s of 1,047 Mountain Children on the Dearborn and Illinois Intelligence Tests. (After Wheeler.)

after birth through certain behavior symptoms. These behavior symptoms may or may not be associated with

⁴ Gesell, Arnold, *Infancy and Human Growth*, New York, The Macmillan Company, 1928, p. 386.

physical signs. Those that are associated with physical signs are, in the majority, of clinical varieties recognized very early. A clinical study will usually lead to a recognition of those without physical stigmata.

The following description of a subnormal pupil of high-school age with which one of the writers has had a number of contacts gives a splendid picture of gross inability to carry on mental processes of any high degree of complexity:

A boy, whom we will refer to as John, is in the fourth grade. He has attended school regularly since he was six years of age. He is slightly subnormal in his physical development, having the height and weight of the average child 13 years and 6 months old. In his schoolwork, he has the ability to read of the average second-grade pupil. He learns his spelling words for the day perfectly, but cannot spell the words of the previous lesson. In arithmetic he knows most of his multiplication tables but cannot multiply 56×9 . He does not seem to be able to remember materials so that he might use them in a problem situation. He lacks the ability to carry on logical associations, but shows ability to carry on mechanical associations. He is very quiet in the schoolroom and appears to be constantly paying perfect attention to the work, although, upon questioning him, he seldom knows what is being discussed in class. Whenever the teacher asks him a question, he usually answers it by one word, which is "yes" or "no."

Too frequently, conclusions as to the hereditary nature of mental inferiorities are drawn from such studies as those of the Kallikaks, the Jukes, and similar families. The diagnosis in all such studies is more or less indefinite and subjective; also, the data are too inaccurate for definite conclusions, although they are sufficient to show that low-grade intelligence is surely associated with inferior intellectual and social levels. Most of these investigators worked upon the assumption that these

families were inferior in mental ability and that the inferiority might be traced to an original biological inferiority. At best, about all that can be concluded from an analysis of these family histories is that social inferiority was present both vertically and horizontally in the families and that it is probably safe to assume the existence of a certain positive relationship, imperfect though it may be, between social inferiority and inferiority in intelligence. However, in harmony with the developmental concept presented in Chapter II, it is to be noted that the child's mental development continues until maturity. Since there is a long period of human infancy, there is a long period of growth. According to the developmental concept presented in our discussion of growth, the extent and form of mental development are dependent upon an inherent structural pattern maturing under the influence of various environmental factors. The development of this structural equipment is analogous to other cellular development and thus dependent upon environmental conditions during the period of growth and especially during infancy.

Mental superiority. The term *superiority*, as it applies to the child's mental activities, refers to those adaptive forms of behavior that appear to involve definite mental processes superior in nature to those used in the adaptive behavior of the average child of a particular age. Mental superiority, however, is not as easy to diagnose in early infancy or even later as is mental inferiority. The superiority of the infant has been observed in its more advanced development in language activities, perceptiveness, and greater "intensification and diversification of behavior." From careful studies of infants, Gesell points out: "The infant of superior equipment exploits his

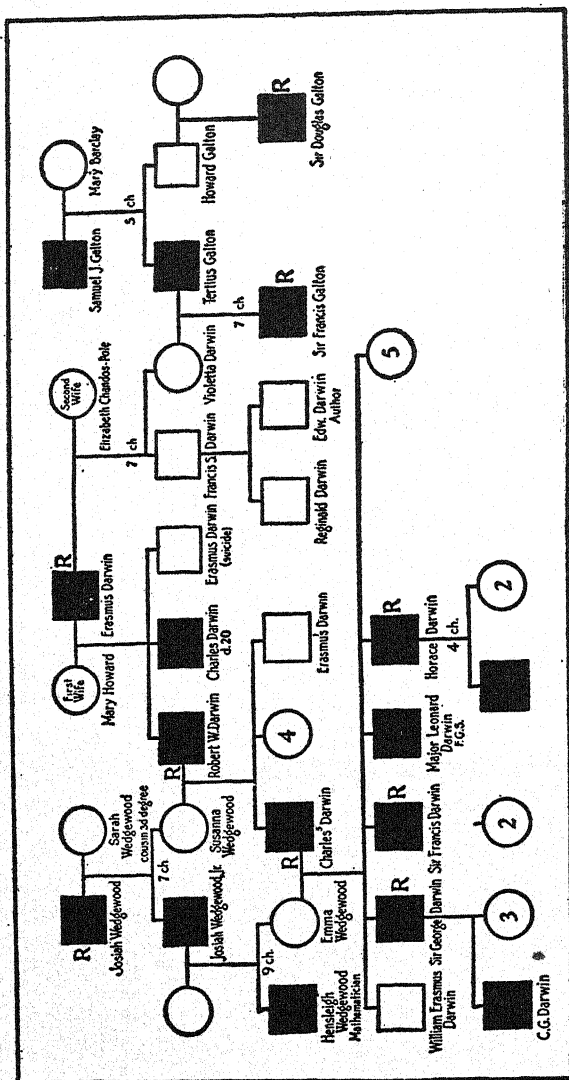


Fig. 11.—The Darwin-Wedgewood-Galton Family. (*After Downing*).⁵ Males of note, black squares; an R beside a square shows membership in one of the Royal Societies. Figures in the circles show the number of daughters if more than one.

⁵ E. R. Downing, *Elementary Eugenics* (1930). Reprinted by permission of the University of Chicago Press.

physical surroundings in a more varied manner, and is more sensitively responsive to his social environment. The most uniform symptoms of later ability which we have found among infants relate to dynamic intensification and versatility of response.”⁶

Some Causative Factors in Individual Variations

The family tree. One of the earliest of these inquiries concerning heredity in families was made by Sir Francis Galton. In his studies he undertook to show that one's abilities are derived by inheritance under the same characteristics and limitations as the physical features of the organic world. Thus, he conducted studies, gathered data, and published these in his *Hereditary Genius* in 1869. For this study he selected 977 eminent men, such as judges, statesmen of England, commanders, men of literature, painters, poets, divines, scholars, and musicians from all over the world. His method was to inquire whether these men had 574 relatives of the same degree of greatness. These great men had about 145 times as many eminent relatives as do an equal group of average men. As a result of these studies, Galton concludes that eminence is dependent upon the family strain passing from generation to generation rather than upon training, association with eminent relatives, or economic advantage.

The inheritance of superior mental traits or genius is shown in single families such as the Wedgewood-Darwin-Galton family. A study of the family over several generations shows a large number of persons of great eminence, renowned scientists, and members of the Royal Society of England.

⁶ From Gesell, Arnold *op. cit.*, p. 396.

Another family noted for the traits of genius is the Edwards family. Richard Edwards married Elizabeth Tuttle, a woman of personal charm and very superior intelligence. Four daughters and one son, Timothy Edwards (father of Jonathan Edwards), were born to them. After Elizabeth died, Richard Edwards married again. This second wife, a woman of average intelligence, gave birth to three sons and two daughters. The descendants from this second union were all of mediocre intelligence only, while the descendants from the first union were eminent men and women. In this family tree we find such famous people as Mrs. Theodore Roosevelt, Mrs. Eli Whitney, the Fairbanks brothers, Grover Cleveland, Ulysses S. Grant, and many others.

Mehus,⁷ in his study, adversely criticizes Galton's *Hereditary Genius*. He says that Galton showed that the noted men of England ran in certain families, and that he drew as conclusions that genius is a matter of heredity and anyone gifted with genius will not fail to rise to eminence and renown. However, according to Mehus he did not prove that genius is due entirely to heredity. Mehus points out that the children in these families had superior educational and cultural advantages, and that this rather than heredity possibly accounts for their eminence. Mehus concludes his study by saying, "We do not want to leave the impression that we consider inheritance of no importance, for we realize that one cannot make a silk purse out of a sow's ear. But on the other hand we feel that the part played by the social environment has been neglected entirely too much in the past. Genius and high mental ability are latent in all classes

⁷ Mehus, O. M., "Have We Over-emphasized Heredity?" *Journal of Education*, June 29, 1931, pp. 705-708.

and are brought out under favorable social environment. Genius is not irrepressible but needs the stimulation of a proper environment in order to be developed."

Co-twin study of individual differences. In trying to determine the effects of heredity and environment on individual variation, Newman has made ten case studies of identical twins.⁸ Identical twins are monozygotic—both arise from a single fertilized egg; therefore, they are indeed quite similar in heredity. A brief review of certain important phases of Newman's twin studies will be presented here.

From these various case studies, we see that Newman took identical twins from the same environment who had been put in separate homes to be raised. The twins were separated from one another from one month up to three years of age. Newman made a study of the environments of the twins to find out how they differed and how they were alike. He gave the subjects intelligence tests and achievement tests to see if there was a significant intellectual difference between the twins. He also gave them emotional tests to see if they differed emotionally.

He found that:

Cases I and II differed intellectually but were similar in temperament.

Cases III, VI, and VII were similar intellectually but different temperamentally.

Cases IV, V, and VIII were different in intellect, temperament, and physical characteristics.

Identical twins reared together were about one and one-half times more similar in mental rating, according to the

⁸ Newman, H. H., "Mental and Physical Traits of Identical Twins Reared Apart," *Journal of Heredity*, 1932, Vol. 23, pp. 3-18, 297-303, and 369-377; 1933, Vol. 24, pp. 209-214; 1934, Vol. 25, No. 2.

intelligence test results, than identical twins reared apart.

As a result of these studies, along with comparisons of fifty pairs of identical twins reared together and fifty pairs of same-sexed twins reared together, he draws the following tentative conclusion: "The actual differences in heredity have about twice as great an effect as do the actual differences in the environment in producing the differences observed in such characters as body-weight, I. Q. and temperament." This does not mean, of course, that heredity is exactly twice as important a factor in producing differences as environment.

TABLE XI
CORRELATIONS BETWEEN INDIVIDUALS WITH
VARYING DEGREES OF HEREDITARY RELATION-
SHIP. (After *Pintner*.)

Identical twins.....	.90
All twins.....	.75
Fraternal twins.....	.70
Siblings.....	.50
Cousins.....	.20
Unrelated individuals.....	.00

Kin resemblance in intelligence. A summary of the number of statistical studies on the resemblance in intelligence of individuals of various kin is presented by *Pintner*. The correlations given are presented in Table XI. These correlations show the hierarchy of relationship one would expect to find in case heredity or family is an important factor in intelligence. However, *Pintner*⁹ points out that these findings are not to be taken as absolute proof of the inheritance of intelligence. This hierarchy of coefficients corresponds to a similarity of environment usually present among such groups of individuals.

⁹ *Pintner, R., Intelligence Testing*, New York, Henry Holt and Company, Inc., 1931, p. 512.

The existence of a similar relationship between the intelligence of children and the occupations of their fathers was found in an English investigation by Jones and Carr-Saunders.¹⁰ This study is of special interest because of the nature of the children used as subjects. The fact that these children were orphanage products presents a situation in which the environment is relatively constant. The children's social status was determined by grading them according to a five-step classification of the fathers' occupations. The subjects were further studied by a division into groups according to length of residence in the orphanage. Mean I. Q.'s for the various groups were computed.

TABLE XII

MEAN I. Q.'s OF ORPHANAGE CHILDREN BETWEEN NINE AND ONE-HALF AND FOURTEEN YEARS OF AGE ACCORDING TO OCCUPATIONAL STATUS OF FATHER AND LENGTH OF RESIDENCE

Groups*	Years of Residence	
	0-3	3-N
1.....	108	107
2.....	105	106
3.....	97	98
4.....	94	97
5.....	94	95

* Group 1 comprises the professional parenthood, group 2 the clerical parenthood, group 3 that of skilled manual workers, group 4 that of semi-skilled labor, and group 5 that of unskilled labor.

Table XII gives the results from this study. The data indicate a slight tendency for length of residence in the orphanage to raise the I. Q.'s for children from the lower occupational classes, while the I. Q.'s of those from the higher occupational classes are probably lowered.

¹⁰ Jones, D. C., and Carr-Saunders, A. M., "The Relation Between Intelligence and Social Status Among Orphan Children," *British Journal of Psychology*, 1927, Vol. 17, pp. 343-364.

However, in this respect the data are not sufficiently reliable to be significant. These results do show fairly definitely that there is an occupational differentiation which is by no means removed by a longer stay in the orphanage.

A later and rather unique study of the resemblance between parent and child when the child is reared away from the parent was made recently in England by Lawrence.¹¹ The subjects for his study consisted of illegitimate children who had been placed in a good but uniform institutional home soon after birth. He further studied a group of children in London schools who were living a normal home life with their parents. Comparisons were made between the latter group (a control group) and the group of children placed in an institutional environment. He found that the institutional children from the upper vocational groups averaged 101.5 I. Q. while those from the group of manual laborers averaged only 92 (Stanford-Binet). In the case of these children, there is a condition in which both groups have had more or less equal advantages. In the London group, the children from the upper vocational groups averaged 105.5, while those from the unskilled laboring group averaged 96.29 (*Simplex Test*¹²). Lawrence concluded in the study, "What finally emerges from this part of the work is that though a child has never lived with its parents, it is likely, other things being equal, to have a slightly higher intelligence if it comes from one of the so-called upper classes than if it is the child of laboring people."¹³

¹¹ Lawrence, E. M., "An Investigation into the Relation Between Intelligence and Inheritance," *British Journal of Psychology, Monograph Supplement No. 16*.

¹² A test standardized in England.

¹³ Lawrence, E. M., *op. cit.*, p. 32.

Evidence from a study of foster children. Foster children offer a splendid opportunity for the study of the effect of changed environment upon mental ability. Studies agree in the main that the median intelligence of the foster child is inferior to that of the average child, although evidence at hand indicates that the foster homes are superior to the average. The study by Burks was designed to measure the mental ability of foster children in relation to various changed environmental elements. In her study, a comparison was made between the relation of mental tests of true parents and their children on the one hand and of foster parents and their children on the other. A great many data were thus gathered and treated statistically. Her conclusions seem to point rather definitely toward heredity as the major factor affecting intellectual traits but with environment probably functioning, especially in connection with character and personality traits. However, the data presented on character and personality traits were less reliable and less objective than the data upon intelligence. The main conclusions arrived at from this study are:

1. Home environment contributes about 17 per cent of the variance in I. Q.: parental intelligence alone accounts for about 33 per cent.

2. The total contribution of heredity (i.e., of innate and heritable factors) is probably not far from 75 or 80 per cent.

3. Measurable environment one standard deviation above or below the mean of the population does not shift the I. Q. by more than 6 to 9 points above or below the value it would have had under normal environmental conditions. In other words, nearly 70 per cent of school children have an actual I. Q. within 6 to 9 points of that represented by their innate intelligence.¹⁴

¹⁴ Burks, Barbara S., "The Relative Influence of Nature and Nurture upon Mental Development; a Comparative Study of Foster Parent-

From the Chicago studies conducted under their direction, Freeman, Holsinger, and Mitchell give a higher estimate of the effect of environment on intelligence.¹⁵ They included over 600 children who on the average were older when placed in foster homes than were those chosen by Burks. They found that children improved in intelligence after being placed in foster homes, and that those placed in better homes made more improvement. Siblings who were separated before they were six years of age and who were reared in different homes gave a correlation of .25, whereas siblings reared in the same home gave a correlation of .50. A group of seventy-four children were examined before and after residence in their foster homes. The average age at the time of placement was eight years and the average period of residence prior to the second examination four years. The average I. Q. at the time of adoption was 95, while the average at the end of the four-year period of residence was 102.5. This study points rather conclusively to the fact that resemblances between ordinary siblings are due in part to the influences of an early common environment.

Environmental factors. In the studying of some of the factors related to individual differences, a number of studies have been made on the social and economic status of parents. These studies were designed to examine the relation of the intelligence of children to the occupations

Foster Child Resemblance and True Parent-True Child Resemblance," in "Nature and Nurture: Their Influence upon Intelligence," *Twenty-Seventh Yearbook of the National Society for the Study of Education*, Part I, 1928, p. 308. Quoted by permission of the Society.

¹⁵ Freeman, F. N., Holsinger, K. J., and Mitchell, B. C., "The Influence of Environment on the Intelligence, School Achievement, and Conduct of Foster Children," in "Nature and Nurture: Their Influence upon Intelligence," *Twenty-Seventh Yearbook of the National Society for the Study of Education*, Part I, 1928, pp. 102-216.

of their fathers. From the findings or results of these studies, it was concluded that the children of superior intelligence had fathers engaged in higher trade occupations, and that the profession is determined to a great extent by mental ability.

Terman¹⁶ made a study of the occupations of the fathers of a number of gifted children or children of genius. He found the percentages of children whose fathers were professional and business men, skilled laborers, semiskilled and slightly skilled laborers, and common laborers. In line with the findings of other investigators, his data showed that the higher types of occupations yield the greatest percentage of gifted children, and the lower types a smaller percentage. These differences in intelligence of the children of different occupational groups are sometimes given as a proof of the hereditary nature of genius, but they may also be given as a proof of the value of a superior social environment in producing geniuses. However, Goodenough¹⁷ found the average I. Q. of preschool children to be 96 for those whose fathers are unskilled laborers and 125 for those whose fathers are engaged in the higher type of occupations.

Cattell,¹⁸ in his study of the fathers of 885 leading American men of science, found the percentages of superiority of the occupational groups of the leading American men of science as compared with the general population to be as follows:

¹⁶ Terman, L. M., "Racial and Social Origin," in *Genetic Studies of Genius*, Palo Alto, Cal., Stanford University Press, 1926, Vol. I, Chap. IV.

¹⁷ Goodenough, T. L., "The Relation of the Intelligence of School Children to the Occupations of Their Fathers," *American Journal of Psychology*, 1928, Vol. 40, pp. 284-294.

¹⁸ Cattell, J. M., "Families of American Men of Science," *The Popular Science Monthly*, 1915, Vol. 86, pp. 504-515.

	<i>Leading American Men of Science</i>	<i>General Population</i>
Professional.....	43.1%	3.0%
Agricultural.....	21.2%	41.1%
Manufacturing and Trade..	35.7%	34.1%

The findings from these studies are thus in harmony. Therefore, we conclude that social class is highly correlated with intelligence and adult achievement. These studies and others on occupational status show that on home rating the mean score of the gifted children is above that of unselected children and far above that of delinquent boys. Divorces and separations are fewer among parents of the gifted than in the general population of California. The schools report unfavorable home conditions for only 8.6 per cent of the gifted group. The average parent of the gifted child has covered about twice as many school grades as the average adult in the population.

Significance of sex. Much attention has been given to the importance of sex in accounting for individual variations. Many theories regarding sex difference have been advanced, and various classifications of traits have been made for the purpose of showing sex differences. Furthermore, stigma has oftentimes been attached to one possessing traits purported to belong to the opposite sex. A few years ago, some educators claimed a superiority of the male sex along intellectual lines. They based such a claim on the fact that males were predominant in the fields calling for intellectual processes. Concerning this intellectual difference, Mark A. May says of the various studies, "In respect to intelligence, or intellectual capacity as measured by a variety of intelligence tests,

there are no consistent differences between the sexes when fair comparisons are made.”¹⁹

It has also been suggested that there is a difference in the spread of variability of the sexes. It has been claimed that the male is more variable than the female and is often found at the extreme in a frequency distribution. For example, surveys show that there are more males than females in institutions for mental defectives, while at the other end of the scale it has constantly been recognized that there are more males than females in the lists of eminent and accomplished persons. However, careful investigations of this problem of variability have resulted in the conclusion that such data are due to certain selective factors. For example, a defective male is more apt to become an anti-social problem, and thus males of even a fair degree of intelligence are often committed to institutions.

Various studies have shown that females excel males in linguistic activities, while the boys excel girls in science and mechanical performances. School grades also show the above to be true. “But,” May says, “no one has been able to show that this difference is one of ability rather than of interest. . . . Intelligence tests that depend on language manipulation (language tests) show no differences in favor of girls; nor do the performance intelligence tests show differences in favor of the boys.”²⁰

Errors in evaluation. In the consideration of the importance of heredity and environment, two errors of interpretation are often made. The first is that of conceiving of heredity and environment as two separate and distinct

¹⁹ From May, Mark A., “Significance of Sex,” in *The Foundations of Experimental Psychology* (C. Murchison, ed.), Worcester, Mass., Clark University Press, 1929, p. 754.

²⁰ From May, Mark A., *op. cit.* p. 755.

TABLE XIII

A GENERAL SUMMARY OF SEX DIFFERENCES (*After Jordan.*)²¹

<i>Female</i>	<i>Male</i>
I. Greater ability to memorize.	I. Greater motor ability:
II. Quality of handwriting better on the average.	(a) Quicker reaction time.
III. Sensibility is more acute in the realm of sensory discrimination, such as in pain, taste, and smell.	(b) Faster tapping.
IV. Greater linguistic ability:	(c) More accurate in thrusting at target.
(a) Better in languages.	(d) Better discrimination in lifting weights.
(b) Better on analogies test.	(e) Stronger grip.
(c) Better on word building.	II. (a) Greater ingenuity in arithmetic reasoning and in tests involving ingenuity.
(d) Write better compositions.	(b) Have more practical information.
(e) Use longer sentences and write longer compositions.	III. Greater resistance to size-weight illusion.
V. Much better in mirror drawing.	IV. Better in physics and chemistry.
VI. Take suggestions more easily and carry them out. Less resistive to suggestion.	V. Three times as many speech defects.
VII. More interested in:	VI. Three times as many color-blind as girls.
(a) Love stories.	VII. More interested in:
(b) Fairy stories.	(a) Stories of adventure.
(c) Stories of home and school.	(b) Magazines of science.
(d) Have different emphases in their plays and games.	(c) War and scouting.
Probably daydream more.	(d) Stories of sport.
Have more "crushes" on each other than boys.	(e) Stories about Boy Scouts.
	(f) Games involving dexterity and skill.

things, and, on the basis of such a philosophy, trying to evaluate the relative importance of each by some such ratio as 40:60, or 80:20, and so forth. In regard to this point, one of the writers recently stated:

²¹ Jordan, A. M., *Educational Psychology*, New York, Henry Holt and Company, Inc., 1933, p. 307.

In certain respects the two sets of factors cannot be separated, since experience is a matter of their interaction; but for the purposes of study the influence of each is often analyzed and contrasted with the influence of the other. . . .

Instead of setting the individual against environment, as is often done, we find upon examination that he is in intimate relation with it at every turn; in fact, we find that only by definition can we separate the individual and his environment.²²

A second error that is made in the attempt to evaluate heredity and environment is viewing heredity fatalistically, that is, noting the person's inherent potentialities and on this basis assuming that nothing can be done for the individual with weak or inferior abilities, and that the individual with good abilities will ultimately attain a rich development. The extreme hereditarians have been inclined to explain all performances on the basis of the maturation or unfolding of certain hereditary potentialities.

Another error, similar in nature to the one just referred to, is often made by those holding an extreme sociological view. This error arises from a confusion of causal associations. Because inferior environment is almost universally associated with delinquency, feeble-mindedness, non-hygienic conditions, ill-health, and the like, one cannot safely say that it is the sole causal factor in producing these undesirable conditions. Only when we study these factors in relation to the total nature of the individual and when we note an inter-causal relationship will we be better able to recognize this problem as a complex one, rather than a simple one that can be solved by some ratio, some simple hereditarian or environmental formula.

Thus, differences in human beings result from both

²² Garrison, K. C., *The Psychology of Adolescence*, New York, Prentice-Hall, Inc., 1934, p. 21.

heredity and environment. It would be foolish to say that either factor is entirely responsible. Neither could function without the assistance of the other. Environment as a general force does contribute to variability, although its effect is restricted. So far as a review of the many studies affords a basis, one cannot conclude that the one is responsible for so much and the other responsible for so much. On the other hand, it is quite certain that both are major and correlated causes of individual differences. Sandiford remarks on this point: "Heredity and environment are correlative factors. Heredity or nature provides whatever potentialities we possess; environment or nurture determines whether or not they shall be realized in actuality."²³

Educational variations. The wide range and the nature of individual differences were discussed in an earlier part of this chapter. A study of these differences as they appear in pupil achievement in school subjects will aid the teacher in better understanding this, one of the major problems in teaching. That educational differences of almost every conceivable type exist is well recognized by alert teachers. The problem of providing a better means of caring for these varying abilities will not be solved with any noteworthy satisfactoriness until a better understanding relative to these differences is attained.

a. *Differences in ability in English composition.* Individual differences within a grade group in the ability measured by the *Nassau County Supplement to the Hillegas Composition Scale* are shown in Table XIV.²⁴

²³ Sandiford, Peter, *Educational Psychology*, New York, Longmans, Green and Company, 1929, p. 49.

²⁴ Garrison, S. C. and K. C., *The Psychology of Elementary Subjects*, Richmond, Johnson Publishing Company, 1929, p. 259.

TABLE XIV

SHOWING THE DISTRIBUTION OF COMPOSITION SCORES ("NASSAU COUNTY SUPPLEMENT TO HILLEGAS SCALE") FOR A SMALL JUNIOR-AND-SENIOR HIGH SCHOOL

Score	Grade					
	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
8.5	—	1	—	1	1	2
8.	1	1	1	1	2	2
7.5	2	2	3	3	2	4
7.	1	1	2	2	4	7
6.5	3	2	1	4	6	5
6.	3	6	7	6	5	5
5.5	4	4	3	4	3	1
5.	4	5	4	2	4	1
4.5	5	2	3	2	2	1
4.	3	3	3	1	1	2
3.5	2	1	1	1	—	—
3.	2	1	1	—	—	—
2.5	—	1	2	—	—	—
1.5	—	—	—	—	—	—
Medians	5.4	5.7	5.9	6.3	6.9	7.1

It will be noticed that there are wide differences in each grade and great overlapping in ability from grade to grade.

b. *Differences in ability to learn algebra.* As a result of a realization that each individual is unique in his learn-

TABLE XV

DISTRIBUTION OF SCORES OF SEVENTH-, EIGHTH-, NINTH-, TENTH-, ELEVENTH-, AND TWELFTH-GRADE STUDENTS ON THE "CROSS ENGLISH TEST." (*Unpublished materials, Jesup Psychology Laboratory of Peabody College.*)

Score	Grades					
	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth
165—169.9	—	—	—	—	—	2
160—164.9	—	—	2	3	3	3
155—159.9	—	1	—	4	6	3
150—154.9	1	2	4	5	10	4
145—149.9	1	2	4	6	6	6
140—144.9	2	1	6	6	4	9
135—139.9	3	3	6	10	7	10
130—134.9	4	6	4	8	6	9
125—129.9	7	4	5	3	8	2
120—124.9	4	6	5	7	5	1
115—119.9	4	2	—	5	—	—
110—114.9	3	5	4	1	3	—
105—109.9	4	5	1	2	—	—
100—104.9	5	4	—	1	—	—
95— 99.9	1	2	—	1	—	—
90— 94.9	—	—	—	—	—	—

ing capacity, schools are coming more and more to give increased attention to the individual. The general trend in high-school teaching is to consider the pupil, not as one

of the group, but as an individual having certain abilities and weaknesses. The differences between pupils in educational growth are shown very well by the results secured by means of standardized algebra tests.

TABLE XVI

DISTRIBUTION OF SCORES MADE ON THE "HOTZ ALGEBRA SCALES—
SERIES B." (After Symonds.)

Score	Addition and Subtraction	Multiplication and Division	Equation and Formula	Problem	Graph
25.....	—	—	4	—	—
24.....	4	—	12	—	—
23.....	25	6	23	—	—
22.....	28	10	44	—	—
21.....	40	37	78	—	—
20.....	54	101	93	—	—
19.....	71	118	125	—	—
18.....	88	136	134	—	—
17.....	117	207	135	—	—
16.....	124	192	148	—	—
15.....	111	162	115	—	—
14.....	104	147	139	7	—
13.....	135	111	127	30	—
12.....	155	99	106	33	—
11.....	146	58	106	74	3
10.....	86	47	72	96	38
9.....	50	33	58	139	102
8.....	35	19	30	182	129
7.....	28	12	18	194	140
6.....	21	1	14	174	122
5.....	5	7	10	161	113
4.....	9	1	6	122	73
3.....	5	1	1	69	30
2.....	3	—	4	18	10
1.....	—	—	—	6	5
0.....	3	—	—	—	2
Mean.....	14.6	15.9	15.7	7.6	7.1
S. D.....	4.1	3.3	4.1	2.6	2.0

The variation that is found in algebraic abilities is shown in Table XVI.²⁵ In this table the scores made on

²⁵ Symonds, P. M., "Special Disability in Algebra," *Contributions to Education*, Teachers College, Columbia University, 1923, No. 132, p. 7.

the *Hotz Algebra Scales* are shown. The wide variation in ability is strikingly pictured.

c. *Individual differences in ability as determined by biological tests.* Owing to the varied interests which they develop, the widely different circumstances under which they live, and their great differences in native capacity, pupils show great variability in the amounts and kinds of biological information which they possess.

TABLE XVII

DISTRIBUTION OF SCORES ON THE RUCH-COSSMAN AND THE COOPRIDER BIOLOGY TESTS AT THE BEGINNING AND END OF THE SCHOOL YEAR.
(After S. C. Garrison.)

Score	Ruch-Cossman		Cooprider	
	First of Year	End of Year	First of Year	End of Year
78.....	—	2	—	—
75.....	—	—	—	1
72.....	—	2	—	—
69.....	—	1	—	1
66.....	—	4	—	1
63.....	—	4	—	2
60.....	—	3	—	5
57.....	—	5	—	7
54.....	—	5	1	2
51.....	—	5	—	12
48.....	—	2	1	9
45.....	1	4	1	12
42.....	—	11	2	13
39.....	—	7	9	8
36.....	3	5	10	6
35.....	2	10	17	8
30.....	6	7	10	3
27.....	3	7	20	—
24.....	4	3	12	—
21.....	20	1	5	—
18.....	15	1	1	—
15.....	15	1	1	—
12.....	15	—	—	—
9.....	5	—	—	—
6.....	—	—	—	—
Upper Quartile..	22	56	35	52
Median.....	19	42	31	46
Lower Quartile..	14	33	26	40

How pupils entering biology classes for the first time differ is shown in Table XVII. The data on which this table is based were secured by giving 90 pupils each of the biology tests named in the table at the beginning and end of the school year. In the first place, at the beginning of the year, the pupils, while showing great variability, were more homogeneous in biology information than at the end of the course. In the second place, some students entering the course possessed more information than others had even after a year's instruction.

d. *Individual differences in the social studies.* In the social sciences, there are many factors that contribute to the wide variations in ability. The pupil's background, educational development, interests, intelligence, and general appreciation for the social science materials encountered are all important items in the development of a background in social science. The *Kepner Background in Social Studies Test* was given to eleventh- and twelfth-grade pupils. The scores made by the pupils are presented in connection with other high-school-subject fields.

Educational provisions. The problem of individual differences in ability, attitude, and interests is one that every teacher constantly meets. Too often the teacher fails to understand that variations are to be expected and that his problem is to provide materials and methods that are in harmony with various abilities and interests. Materials that are more or less meaningless and abstract for one pupil may be challenging as a living problem for another. A significant problem for an alert student may be a worthless problem for the slothful one. It is well for the teacher to set up goals and recognize the importance of certain essentials, but she must ever recognize

further that goals and essentials are not fixed points or amounts that are the same for all pupils.

A study of practices in making provisions for superior

TABLE XVIII

DISTRIBUTION OF SCORES OF A SMALL HIGH-SCHOOL GROUP ON THE "KEPNER BACKGROUND IN SOCIAL STUDIES TEST." (*Unpublished materials, Jesup Psychology Laboratory.*)

Score	Eleventh-Grade Total	Twelfth-Grade Total
95—99	—	1
90—94	1	1
85—89	1	2
80—84	3	—
75—79	8	4
70—74	3	4
65—69	2	4
60—64	5	—
55—59	—	2
50—54	3	—
45—49	1	—
40—44	3	—
Median score	71.67	73.75

children is reported by Dorothy W. Jensen.²⁶ By means of a detailed questionnaire, she obtained data from forty-

²⁶ Jensen, Dorothy Williams, "The Gifted Child: III, Present Practices in Special Classes for the Gifted," *Journal of Educational Research*, 1927, Vol. 15, pp. 198-206.

five school systems which had previously reported that they maintained classes for the superior pupils. Completed questionnaires were received from twenty-eight of these school systems. On the basis of these data, she noted that additions were usually made to the school curriculum to provide further work for these gifted pupils. "More reading and a modern language, usually French, as well as more work in music and art, are commonly mentioned." There is no consistency, however, in the type of curriculum changes that have been instituted to care for this superior group.

This study, along with other studies that have been made on this and related problems, reveals that a more traditional academic set-up is often presented for the superior group. This program is oftentimes supplemented by extra-curricular offerings in art, music, literary activities, and the like.

Thought Problems

1. Discuss the general nature of individual differences. Why did early man explain differences as he did?
2. If data are available, study the variation of a group of high-school pupils. What range do you note? What are the general characteristics of these differences?
3. Study the data of the text dealing with the distribution of individual abilities on various tasks. What is the general significance of such data? What use can be made of them?
4. Evaluate the various materials referred to as to the causative factors in individual variation. Why is it so difficult to say just what part the various causative factors do have in making the wide range of individual differences?
5. Represent by a frequency curve two distributions having an equal average but a different range. Cite the operation of these distributions in a school activity.

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CHAPTER VI

Social Development During the High-School Period

The high-school pupil is more than a mere biological organism which has emerged through procreation and is reaching maturity through life activities. True, the individual organism arises through the modification and elaboration of his biological characteristics. The high-school pupil began his social participation during the period of infancy. The foundation for his future behavior patterns is laid down during the early years of conditioning. Through social interactions, his social habits are formed. The personal-social influences operate in determining the direction of his behavior and the content and meanings he attaches to the various situations of life.

What is meant by social development? Social development is not to be differentiated from physical and mental development. These are all but different aspects of the individual's life and are studied more or less independently merely to make it easier to trace development. *Physical development* has reference to the internal changes which occur as the individual becomes older, the term sometimes being used to include growth in motor co-ordinations as well. *Mental development* concerns the growth of the individual in his ability to learn or to profit from experience. *Social development* refers to the maturation of the individual in his social relationships.

As the child reaches an increased maturity, his interests, attitudes, and, in fact, entire outlook on life undergo a gradual transformation. This is especially true during the preadolescent and adolescent years of life. Chapter VII points out some of the characteristic interests of adolescence, which indicate that, during the period of transformation from childhood to adulthood (adolescence), developments related to attitudes, interests, desires, and the like, are undergoing a more rapid progress. Simple illustrations taken from the reading and play interests will indicate the nature of this change. Animal and doll stories mingled with the fairy element are a source of especial delight for the seven- or eight-year-old girl, but when the same girl is thirteen or fourteen, she will be found revelling in stories of the juvenile-fiction type. Concerning this condition, Sister Celestine Sullivan writes:

Two fundamental causes lie at the bottom of the child's preferences in these situations: one, the intellectual factor affecting his conduct; the other, his growth in social maturity. Thanks to the efficiency of the intelligence test movement, the first may be measured with comparative accuracy. Researches in the problem of social maturity have not yet put us in possession of adequate norms for evaluating quantitatively the effects of increasing maturity upon the social habits and conduct of the growing child.¹

Some factors influencing social development. Some very interesting and unique approaches have been made to the problem of measuring social development. Furfey has developed a scale consisting of six tests which gave an average coefficient of reliability of .91 for age groups from

¹Sullivan, Sister Celestine, "A Scale for Measuring Developmental Age in Girls," *Studies in Psychology and Psychiatry*, 1934, Vol. III, No. 4, p. 1.

eight to eighteen.² This instrument was used in studying the relation between mental age and developmental age with the result that the average correlation obtained when the age factor was controlled was below .20.³

The experiments that have been made in an effort to ascertain the influence of certain physical measurements on social maturity show some evidence that the relationship is closer during the adolescent years. Zaluondo's study in which various physical measurements were made and correlated with social maturity bears this out.⁴ There is evidence that a low positive correlation exists between dental development and social maturity in groups of equal chronological age.

It is likely that the child's early social habits and social interests are very definitely related to his social development. It is in this respect that such factors as playmates, home conditions, relatives, and socio-cultural status are associated with social maturity.⁵

Primary and higher emotions and their role in social behavior. However one may care to designate the emotional experiences of the human being, it must be admitted that, from the point of view of common sense and everyday life, these experiences vary not only in intensity but also in permanency and degree of simplicity. Anger itself

² Furfey, P. H., *Test for Developmental Age, Form B-3*, Chicago, C. H. Stoelting Company, 1931.

³ Furfey, P. H., "Relation Between Mental Age and Developmental Age," from *Report of the Fourth Conference on Research in Child Development of the National Research Council*, Chicago, June 22-24, 1933.

⁴ Zaluondo, Celestina, "A Study of the Relation between Developmental Age and Some Physical Measurements," unpublished master's thesis, Washington, Catholic University of America, 1930.

⁵ See Merwick, Jerome, "The Influence of Urban and Rural Residence," from *Report of the Fourth Conference on Research in Child Development of the National Research Council*, Chicago, June 22-24, 1933.

varies from the simple, profuse behavior activities present under an emotional strain to a more complex form involving hatred and vengeance heaped upon individuals, families, and nations. The sex emotion varies from the simple erotic responses of the child to the enormously complex forms of social behavior present in social intercourse and the acts of chivalry.

In the higher emotions, two factors are especially in evidence, one of which has already been referred to indirectly. The first of these is an integration of many emotional states into a more complex emotional pattern, and the second the presence of a degree of intelligence sufficient to give unity to the pattern of emotions and a fair degree of permanency to the emotional expressions. One who studies the emotional life of a feeble-minded person will be quite struck by the lack of higher emotions in the feeble-minded. Their emotions are truly transitory, their reactions not being delayed and their responses not being carried over consistently from time to time to varying situations. The feeble-minded person harbors no special emotional attitudes, for attitudes and sentiments are not a large part of his behavior reactions. His reactions are not made up of ideas; rather, *fear*, *anger*, and *love* as socially conditioned will make up his emotional habits. The normal child will come much nearer to retaining emotional patterns and will be more likely to give them permanent aspects and to integrate with them other mental-emotional behavior patterns.

Our lives are governed in the main by higher emotional states. These are probably the basis of most attitudes, sentiments, prejudices, and even ideals, and they are especially important in relation to the ambitions of ado-

lescents, the volitions of adults, and the "will to win" spirit. With the child's increased visceral growth, his new social contacts, his added sex drive, and his enlarged mental horizon, we find a group of traits which well-nigh predispose him to develop many and oftentimes very positive and intense higher emotional habits. In intelligent behavior, certainly, a succession of emotion-provoking stimuli, a heightening of suggestibility, the development of a prepotent action tendency, and a decrease in pure reasoning—all of which find expression in an act of utmost individual and social import—may be found.

Social versus individual development. The modern trend in education has been towards socialization. It has been recognized that individuals must be more socially conscious and develop more suitable social habits than were necessary when each family lived almost unto itself and each community almost wholly within its limits. We have passed beyond the stage of social isolation and tribal pride into a state of social organization and reorganization and a need for devotion to civic duty and for civic responsibility. *Organization, co-operation*, and like terms express our national outlook, and they are and should be penetrating our schools.

However, this new emphasis upon the socialization of school may quite overleap its proper bounds. The school must not assume that the individual is entirely a social product. Some educators who otherwise are quite willing to make provision for native differences are very eager to establish absolute uniformity in social behavior, and in consequence certain trends of education tend to turn the school into a machine for producing standardized social

products. It is not desirable to stamp out individuality and substitute for it a common type of sociability.

The notion of high individual attainment is not in conflict with the notion of the common good, neither is it out of harmony with a fuller concept of democracy. A democracy should strive to give each individual the opportunity to develop his abilities in order that the general welfare of the group and the individual may be furthered. The notion that the only measure of an individual's development is in terms of his acceptance of the folkways of the group does not allow for the expression of individuality. Furthermore, the notion that progress is a matter of social development is out of harmony with actual facts. It is well stated that "character is nourished in a life of action with others; talent is nourished in solitude." If the latent talent or ability of an individual is to grow and ripen with the maturing years of educational development, there is a necessity for individual efforts. Thinking has been referred to as silent and best carried on without interfering stimuli. James Russell Lowell said concerning it: "Solitude is as useful to the imagination as society is wholesome for character."

Social training and participation. The child is to a large degree a mass of energy. If our social forces deny an outlet for these impulses and surplus energy, the child will seek one covertly. Here we find the groundwork for deception and shame. Lying is often resorted to because of the fear of facing social reality. Social participation does not develop in a vacuum. Intelligence and school success are not sufficient, but participation in social experiences of a desirable nature is essential.

The teaching of co-operation, social understanding, and self-control requires (1) careful planning of situations to

which these activities are the natural and successful responses, (2) provisions for building a group morale which supports the desirable mode of conduct, (3) group participation in performing the various activities, and (4) increasing complexity and difficulty of situations in order that general principles may grow and be brought into play for the guidance of future conduct and the integration of behavior units.⁶

The high school and social maturity. Statistics on school attendance show that there is a considerable elimination of children, for one or another reason, in the lower school grades, and that in consequence the pupils who reach high school are highly selected. Now, while this elimination is due in part to inferior intelligence and the inability to do more advanced academic work, other factors—such as have already been described—may be operative. Thus, social maturity, which varies considerably from pupil to pupil, affects high-school interests and activities importantly. It is likely that a child of a certain intelligence who has made a satisfactory social adjustment will be better fitted to pursue his studies than will a child of equal intelligence who has failed socially. We have no objective means of measuring social development, our social goals are but vaguely defined, and our methods of social training are still in the experimental stage; hence, it is exceedingly difficult for teachers to make provisions for individual differences in social development. A knowledge of the pupil's social attitudes and social habits is important in his educational guidance and direction.

With the child's further maturity, well-established so-

⁶ Hartshorne, H., and May, M. A., *Studies in Service and Self-Control*, New York, The Macmillan Company, 1929.

cial institutions tend to give way somewhat, in his social contacts, to those which are less well-established. Interests and activities, as we have noted, become related to clubs, fraternities, fashion, the spirit of the times, gangs, and the like. Thus, extracurricular activities of various types have come to be a potent force, in harmony with the interests of adolescents, in meeting adolescent needs. Some have pointed to these extra activities as a means of diverting the student's attention away from the real task of the school. But Swanson concludes from a study of 398 graduates from Kansas City high schools:

On the whole, the evidence adduced in this investigation points to the thesis that high-school pupils of somewhat more than average intelligence participate in extra-curricular activities, probably as a means of expressing their intelligence beyond the demands of the curriculum and that such participation does not significantly affect their scholastic standing.⁷

Club work as a part of the extracurricular program is coming to have a more and more important part in the lives of junior- and senior-high-school boys and girls. It is here that talents developed in solitude are molded and integrated into the developing habit patterns. It is here that growing individuals are given the opportunity to express their exact needs and abilities more successfully. Club work can best be directed through indirect suggestions; hence, by means of it the pupil is led to a better realization of his limitations and possibilities.

The importance of citizenship training. The complexity of our social order, the growing inter-connections of our various social and economic units, and the increase of

⁷Swanson, A. M., "The Effect on High School Scholarship of Pupil Participation in Extra-curricular Activity," *School Review*, 1924, Vol. 32, pp. 613-626.

governmental activities have tended to increase the necessity for citizenship training. Any educational movement that is meant to reach all future citizens must begin below the senior-high-school level, since such a large number of pupils enrolled in public schools never enter the senior high school.

Respect for authority, a feeling of part-ownership of public property, and a pride in civic cleanliness and beauty should be a part of this early training. In the upper elementary grades and junior high school, the pupils should be given a more specific and detailed account of civic problems. Courses designed for this purpose should not be purely theoretical or drawn from a textbook written for a community set up as a standard. These courses should partake of a laboratory nature, and the community studies should be made at first hand by the maturing boys and girls.

A reasonable amount of training which leads to definite conformity with customs is desirable. This is especially true where others are involved and a fixed time or place schedule is necessary. However, there is a strong tendency for society to fix definite ways of doing things and to enforce habit formation by interference and inhibitions instead of allowing the child to learn by doing the task unhindered. Only when the pupil is allowed to choose his own plans of work and his own tasks, under sympathetic guidance, can he understand the true social significance of his actions.

Probably one reason why we have made no greater progress in social development lies in the fact that, in most situations in life, the child is responsible to some autocrat—the teacher, gang leader, or parent—instead of to a high

notion of social responsibility. If social education is to mean anything, inner controls must be substituted for such outer ones. Herein lies the opportunity of the school in social education. Only by allowing the child freedom in selecting and doing tasks is it possible to transfer authority from other persons to personal standards and ideals. In teaching the more formal subjects of the curriculum, teachers rarely provide opportunities for the development of personal standards. The subjects are so well organized and the school is so definitely standardized that any tendency to originality is frowned upon. Fortunately, extracurricular activities are becoming increasingly important and are obtaining more than a minimum of teacher guidance.

Social development and self-expression. The failure of the junior and senior high schools to adjust their programs in harmony with the interests and abilities of the increasing number of pupils entering high school is probably the greatest accusation that might be heaped upon them. Their failure to do this is probably a result of our democratic idea carried forth in a false direction. It should be the aim of the school to give the child the opportunity to develop those abilities that he possesses, rather than to set up a great educational ladder in the effort to fit the abilities of all. Dissatisfaction with schoolwork grows out of one or a combination of several things, among which are: (1) lack of ability to do the work, (2) lack of interest in the work, (3) influence of the home or some companion in connection with the school program, and (4) a general personality conflict with those in charge of the schoolwork that must be met in a face-to-face manner. Truancy from school by one individual followed by sev-

eral playing "hooky" at the same time is quite often the beginning of mischief that leads to the juvenile courts. The school can by directing a part of its attention to the problems related to truancy aid considerably in stopping crime at its very beginning.

Play and moral development. A life of action in contact with others is necessary for the formation of character. Talent may be and usually is nourished in solitude, but character is formed by building up habits of conduct. These habits of conduct get their moral quality chiefly from their effect upon others. Miss Blanchard says:

Adaptation to others may begin even in the play of early childhood, when toys must be shared with little playmates. In later childhood, although the struggle is for individual supremacy, this must be attained honorably and without breaking the rules of the game. The child who cheats and does not play fairly is soon ostracised by his companions. Ethical standards are taught not by moral precepts but through bitter experiences in what happens to the unethical, and there can be no more lasting lesson.⁸

The value of play as a means of developing character, even for the young child, can be observed. In play life, the child is brought into contact with reality and is thrown upon his or her responsibility and ability to meet the situation. In the simple games of the child "the rights of others" are brought clearly to the child's attention. The play of the group is an index to the customs and ideals of the community represented. The group activity reaches its fuller and final perfection in the organized teamwork of adolescents. It is here that the finer traits of character quite often find their beginning.

⁸ Blanchard, Phyllis, *The Child and Society*, New York, Longmans, Green and Company, 1928, pp. 141-142.

Another value of play as a means of education lies in socialization. Generally, one will grow, develop, and learn to co-operate with others when he has an active share in an activity. It is here that we note the operation of a sound principle in the formation of habits pertaining to group co-operation.

Social studies and social development. The course our behavior takes is conditioned by the attitudes and ideals we hold, the ends we really and truly seek. These attitudes and ideals initiate and direct and thus contribute to each experience. Therefore, the establishment of attitudes and ideals should be the primary aim of the social studies experiences. The sole responsibility for social and civic development must not be left to the social science teachers of the school. If the entire school group fails to accept the thesis that the school must be an institution in which youth may live with their contemporaries and with trained adults in a constructive, co-operative society, the experiences in the social studies, even if most carefully guided, in terms of promoting the establishment of enduring attitudes and ideals may be lost. In studying social life, social problems, and social enterprises and practicing social participation, students should be motivated to a keener desire to co-operate and live intelligently with others, and should be in a better attitude to co-operate intelligently in initiating and carrying out socially worthwhile enterprises. There should thus be engendered a spirit of tolerance, understanding, and sympathy for opinions, beliefs, modes of life, and similar possessions of other groups of peoples.

Science and social development. Many characteristics operate in the development of a social being. This de-

velopment cannot be accomplished by a formal program or by the teacher's efforts alone. Pupil participation in the process is essential. The natural sciences can furnish a real opportunity for such participation. They may influence the growing character by emphasizing the harmonious, unchangeable laws and facts of nature rather than presenting some idealistic conception of nature.

The term *science* as used here implies the natural sciences, such as physics, chemistry, and biology. Let us note, then, what relation science instruction may have to the development of socially desirable citizens. Through the correlation of natural science materials with social and economic problems, the pupil will develop a clearer understanding of the causal relationship of all phases of man's activities. He will then come to see science in its functional relation to a dynamic civilization. Attitudes established in science classes can thus be applied to the functional relation of science to man's social nature. When the scientific forces that have played leading roles in the development of our civilization are considered in their functional relation to man's cultural development, the student's appreciation and understanding of present-day cultural patterns are enlarged and enriched.

There is a constant interrelation of the operation of science and the social habits of man. The high-school boy with an interest and ability in zoology is more likely to establish social habits that relate to the activities of animal life than is the case for a boy without such an interest and ability. His leisure activities will be colored by his science interests, and his final vocational choice will be made in a large measure as a result of such interests. Science is, therefore, closely related to our recreational

and vocational habits, and is thus an important determinant of our social habits and outlook. Without a knowledge and appreciation of the operation of science in the universe, social and cultural development is likely to be conceived of as a result of accident and man as a social creature a mere by-product of a somewhat static social order.

Summary. The epigenetic point of view offers a clear understanding of the true nature of developing social creatures: man as a social creature could not exist apart from the institutional life which has made him social, whatever direction his growth has taken. Studies of individuals who have been largely unaffected by social—and thus institutional—stimulation reveal that man is social chiefly because he is born into a social environment. Needless to say, however, certain inherent drives which tend to draw individuals together exist.

Modern educational practices should be designed to lead out of the individual's original nature the best that is in him for the advancement of the self and the group and to guide and modify innate tendencies so that the youth shall be fitted not only to live in an adult civilization but also to further this civilization. If the individual is to develop desirable social habits, it is imperative that he be given the opportunity for the practice of such habits. Social maturity is in a large measure the development of adult ways of thinking, living, and behaving. Education should strive to set up situations that will lead to a better understanding of man and his relation to his fellow man and to the physical forces of the universe. Habits of co-operative activity, social living, and social understanding should be a part of the goal of education. There is a

danger, however, in the attempt to establish uniformity of social behavior, and there is a further danger in considering the individual as a social product alone and failing to recognize those qualities that make for individuality and thus the versatility of our civilization.

Thought Problems

1. Show how the epigenetic theory of development operates in explaining social development.
2. Note the differences in the social interests, attitudes, and general development of a group of four-year-old boys and girls and a group of seven-year-old boys and girls. What outstanding differences do you observe? Comment on sex differences in the two groups.
3. What school subjects may be well used in the social development of the child? Why are these more useful in this respect?
4. What are some school practices that may be very effective in social development? How do the teacher's attitudes function to a large degree here?
5. Is the child of fourteen or fifteen years of age ready for high-school work merely because he has reached a new period of development? What are some problems involved here?

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126 Social Development in High School

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CHAPTER VII

Interests and Attitudes

In our newer concepts of the development and growth of the individual, his interests and attitudes are of increasing significance. They are important from the functional point of view for predicting and controlling behavior through a knowledge of those interests and attitudes which are dynamic in the individual's behavior. They are of added importance as educational goals in our modern concepts of the purpose of education.

The significance of the effective life of the high-school pupil depends on the degree to which it harmonizes with and aids in achieving the highest educational values. Consequently, one of the first duties of every teacher is to find out what are the factors which motivate the pupil's activities.

When the pupil comes to high school, his attitudes and interests are of great importance. How does he regard others? How does he regard himself? What are his attitudes towards his elders? His parents? Society as a whole? How does he regard religion and morals? Has he learned to play fairly? Who are his companions? What books does he read? Does he have deep and abiding interests? Are his interests wholesome and are they growing? The answers to these questions would determine in a large measure the nature and direction of the

guidance of the pupil in finding and developing desirable attitudes and interests.

The origin of interests and attitudes. It is sometimes assumed that a knowledge of the origin of interests and attitudes is not important for the high-school teacher since the adolescent is far removed in point of time from the origin of most of those possessed by him. This assumption is based on the fallacious idea that all a high-school teacher needs to know of a pupil is his present status. In contrast to this notion, it may be stated that the teacher needs to know how and why the pupil has become what he is. To ignore the problem of the genetics of interests and attitudes is to neglect psychological facts having the most important bearings on guidance and teaching.

Because of the nature and organization of the individual, some interests and attitudes are more easily acquired than others. A listing of structures and organs which make possible the acquisition of interests and attitudes belongs more properly in general psychology and will not be attempted here. Likewise, an analysis of the child's environment for the purpose of determining factors which motivated his activity is omitted here. The point should be made, however, that interests and attitudes are acquired in relation to the child's activity concerning the things met in life.

Many activities were formerly regarded as *instinctive*. One writer stated that interest exists in the nature of the child, and that it is unnecessary for the teacher to attempt to create it. Another said that interests are of two kinds, those which are inborn and those which are acquired. Many of our modern textbooks in education are based on this inadequate biological concept of the nature of the

individual. All knowledges and whatever enters into one's mental life as interests and attitudes are developed as the individual reacts to his world.

The nature of the child's experiences determines in large measure not only his interests and attitudes, but the direction that the growth of his interests and attitudes will take. The individual's interests and attitudes at the time he enters high school are not static but dynamic. In guiding his future activities, the teacher must consider this.

In a few of the most fundamental activities of life, such as feeding, the hereditary organization of the individual determines to a large degree the direction of development. These activities are not of great importance for the school. However, the interests and attitudes which an individual develops because of his own particularized experiences are highly important. They form the bases on which the school must build.

The meaning of interest. It is quite clear from what has already been pointed out concerning the adolescent that he is in no sense a passive agent in a constant environment. The mode of reaction on the part of the adolescent is determined not only by the environment but by the energies of the organism directed in some specific direction due to the changes that have been wrought in the neuromuscular system during the earlier years of experience and development. Interest is purposive to the extent that a situation produces in the individual a response of such a nature that certain desires and strivings are set forth toward a realization of the end in view.

The word *interest* is derived from the Latin word *interesse*, which means to be between, to make a difference, to concern, to be of value. Interest has been characterized as that "something between" which secures some desired

goal or is a means to an end THAT IS OF VALUE TO THE INDIVIDUAL because of its driving force, usefulness, pleasure, or general social and vocational significance. Interest is a form of emotional state in the individual's life which is interrelated with the general habit system of activity. Moreover, during a state of interest, certain parts of the environment are singled out, not merely because of such objective conditions of attention as *intensity*, *extensity*, *duration*, *movement*, and the like, but also because of the fact that changes have been established in the neuromuscular system which cause the organism to favor some reactions to the exclusion of others. The term *interest* has ordinarily been used in describing how or explaining the reason why the organism tends to favor some situations and thus comes to react to them in a very selective manner. Interest is directly related to voluntary attention, and it is when interest is not present that attention tends to fluctuate readily.

The organism must be considered in terms of the biological and social drives that have been referred to; thus, with the growing knowledge and experiences developing and integrating special habit patterns, we have an individual reaching adolescence with both "intrinsic" and "extrinsic" interests present. It is, of course, well that there be a balance existing between these interests. In the various differentiations that have been made between play and work, one will usually find a general thought: the attitude of the doer is probably the greatest of the factors that differentiate work and play. Also, play is less concerned with monetary values than is work—although, of course, not all forms of work regard such values. Play is rather characterized by activity from which the player gains pleasure. Pleasure, then, rather than monetary values, seems to be

supreme. There is a striking similarity in the features of play of different nations and races, yet there is a wide variation in the specific types of play pursued; that is, the values sought are similar but the means differ.

Growth of interests and attitudes. The early interests of the child are mostly, if not entirely, egocentric; that is, they are based on purely personal relations and have to do largely with the physiological welfare of the individual. As the child grows older, purely physiological interests assume a place of lesser importance, but all activities have a somewhat personal bearing. These physiological interests are almost exclusively biological in nature in that they serve a place in the economy of life. By the time adolescence is reached, however, they have been greatly modified, and many others developed, through experience. A survey of adolescent interests shows a wide range in contrast to the limited interests of the young child.

It may well be said that innate ability sets a limit to the possibility of the child's profiting from potential experiences, but that, as he is able to profit from these, his interests and attitudes are formed. The interests which the adolescent develops in the things about him and the attitudes that he takes toward others and himself and toward his place and activity in the world determine his personality development. Those social institutions, such as the school, which are able to provide wholesome, worthwhile experiences are able to determine the character and direction of pupil interests and attitudes. The pupil, because of his biological nature, will develop interests and attitudes whether society so desires or not. By control of the pupil's experiences through guidance in proper activities, the fundamental personality dispositions of interests and attitudes may be controlled.

Ability and interest. One of the most important problems relating to the development of interest may be stated in question form: How closely are interests and abilities related? Is there a relationship between the degree of interest which a pupil has in a subject and his ability in that subject? The common-sense view is that, on the average, a pupil who likes a subject does better in that subject than one who does not like it so well.

This common-sense view is supported by experimental investigations which show that there is a fairly close correlation between ability and interest in a subject. One of the early studies¹ found a correlation of .89 between interest and ability, when ability in a subject was correlated with interest in that subject as estimated by 344 college students. The same investigator found a correlation of .66 between estimates of elementary-school interests and ability in college. In another study² using the same methods with 140 college students, correlations between school interests and abilities as follows were found: for the elementary school, .73; for the high school, .79; and for the college, .73. In a more recent study,³ pupils' interest in history as determined by the preference of the pupils and scores on objective history tests gave correlations ranging around .40. In another recent study, Nemoitin asked 150 students completing their fourth year in high school to indicate the course they liked best, the

¹Thorndike, E. L., "Early Interests: Their Permanence and Relation to Abilities," *School and Society*, 1917, Vol. V, pp. 178-179.

²King, J., and Adelstein, M., "The Permanence of Interests and Their Relation to Abilities," *School and Society*, 1917, Vol. VI, pp. 359-360.

³Bassett, S. Janet, "Retention of History in Sixth, Seventh and Eighth Grades with Special Reference to the Factors that Influence Retention," Baltimore, The Johns Hopkins Press, 1928.

one they liked next best, the one they disliked most, and the one they disliked next.⁴

The average grade received during the three and one-half years was computed for each student for each course rated for interest. Correlations between the variables and the average grade for the various courses were obtained. All the correlations indicated a significant relation between interest and ability. In 80 per cent of the cases, the average grade of the courses liked best was higher than the average for all work during the three and one-half years; while in 83 per cent of the cases, the average for the courses disliked most was lower than the average grade for all the courses.

Despite the fact that interest is related to ability, one must not generalize too far on this basis. There is the general question of individual variation. The subject might be more interested in this special line of activity than in any other and have better ability in it than in most other activities but still have very little ability in it because of a general deficiency. One should not, therefore, make individual comparisons of abilities on the basis of interests present. It is much safer to consider the individual's ability in other activities. "Interest is closely identified with an individual's best ability, but does not insure that he will be superior to other individuals with less interest."⁵ Furthermore, studies show that brighter boys and girls are more likely to be interested in those activities which they can succeed in but which require superior learning. Book found:

⁴ Nemoitin, B. O., "Relation Between Interest and Achievement," *Journal of Applied Psychology*, 1932, Vol. 16, pp. 59-73.

⁵ Garrison, K. C., *Psychology of Adolescence*, New York, Prentice-Hall, Inc., 1934, p. 159.

The brightest boys show a decided preference for mathematics and science, the brightest girls for foreign language.⁶

Interest in play. The values of physical activities are as various as the values of life itself. The physical, mental, social, and moral natures owe much of their development to play. Play activities tend to supply the adolescent with physique, health, neuromuscular skills, and the desire for recreation. Pupil interests in play are conditioned largely during the adolescent age; such forces as environment, age, sex, race, custom, and intelligence operate to effect various differences.

Play has been interpreted by some as the "school of infancy and early childhood," a concept which has received very strong support from G. Stanley Hall and others who hold to the recapitulation theory as applied to human behavior. The recent tendency to consider growth

TABLE XIX

PLAY ACTIVITIES ENGAGED IN BY MORE THAN TWENTY-FIVE PER CENT OF PUPILS OF JUNIOR-SENIOR-HIGH-SCHOOL AGE. (*From Lehman: "The Play Activities of Persons of Different Ages," "The Pedagogical Seminary," Vol. 33, pp. 250-292.*)

Girl's Activities

Riding in an automobile.	Playing basketball.
Making excursions to woods, parks, country, etc.	Playing card games.
Going to the movies.	Roller skating.
Going to parties or picnics.	Swinging.
Visiting or entertaining company.	Jumping or skipping rope.
Listening to the victrola.	Dressing up in older persons' clothing.
Playing the piano (for fun).	Playing school.
Looking at the Sunday "funny paper."	Playing hide-and-seek.
Reading jokes or funny sayings.	Running and romping.
Reading the newspapers.	Gathering flowers.
Reading short stories.	Cutting paper things with scissors.
	Whistling.

⁶ From Book, W. F., *The Intelligence of High School Seniors*, New York, The Macmillan Company, 1922, p. 173.

TABLE XIX (Cont.)

Girl's Activities (Cont.)

Reading books.	Telling or guessing riddles.
Writing letters.	Playing "catch."
Singing (for fun).	Telling stories.
Looking at pictures.	Drawing with pencil, pen, or crayon.
Sewing, knitting, crocheting, etc. (for fun).	Playing with pet dogs.
Painting with water colors.	Listening to the radio.
Going to entertainments, concerts, etc.	Watching athletic sports.
Doing gymnasium work.	Dancing.
Just imagining things.	Social club activities.
	Driving an automobile.
	Hiking or strolling.

Boy's Activities

Playing baseball.	Shooting a gun.
Playing "catch."	Doing gymnasium work.
Riding in an automobile.	Telling stories.
Watching athletic sports.	Singing (for fun).
Playing card games.	Driving an automobile.
Listening to the victrola.	Making or using a wireless or other electrical apparatus.
Listening to the radio.	Going to parties or picnics.
Looking at the "funny paper."	Going to entertainments, concerts, etc.
Reading jokes or funny sayings.	Listening to stories.
Reading the newspapers.	Social club activities.
Reading short stories.	Playing indoor ball games.
Reading books.	Dancing.
Writing letters.	
Whistling.	
Playing football.	

as a continuous process and the further emphasis on the recreational phase of activity have modified this notion of play.

Studies by Lehman and Witty show that interest in play cannot be confined to early childhood. They gathered data from 6,881 children concerning activities in which the children had engaged during the preceding week and the number of activities in which they had participated alone. The data thus gathered led the investigators to conclude:

1. Attempts to differentiate certain C. A. periods in terms of differences displayed by children in diversity of play activities seem unjustifiable.
2. The play trends which characterize a given age group seem to be the result of gradual changes occurring during the growth period. These changes are not sudden and characterized by periodicity but are gradual and contingent.
3. Nor can any age or group of ages, between 8 and 19 inclusive, be characterized as disclosing play behavior primarily social or primarily individualistic. . . . Such a practice is unwarranted.⁷

Today play activity of some kind is recognized as of value in all stages of life. The time is past when, like our Puritan fathers, we turned from the play activities because they were a total "waste of time." Only the idle, daydreaming child who indulges in fantasy instead of wholesome play activity wastes his time. In the extensive studies of play conduct by Lehman and Witty two very important facts were revealed. These are: (1) play is a continuous process rather than an activity confined to the period of childhood; and (2) there is an enormous overlapping in play interests for individuals of the same age but of different sex, of different racial groups, or of different intelligence levels.⁸ In the case of sex differences, boys' games were found to be a bit more vigorous and better organized. The differences appearing in different communities revealed that sex alone was not responsible for the nature and interests in play.

There is no evidence that children of superior mental ability are lacking in play interests. The study of Lehman and Witty is of special interest in connection with this problem. From a comparative study of fifty gifted

⁷ Lehman, H. C., and Witty, P. A., "Periodicity and Growth," *Journal of Applied Psychology*, 1927, Vol. 11, pp. 106-116.

⁸ Lehman, H. C., and Witty, P. A., *The Psychology of Play Activities*, New York, A. S. Barnes and Company, 1927.

children (children with an I. Q. of 140 or above) and fifty mentally average children of like age, sex, and environment, they conclude:

The gifted group and the control group of children demonstrated the same versatility of interest in play and engaged in the *same number* of activities.

The gifted children included in this study were found to be *more solitary* in their play than average children.

The gifted children engaged more frequently in, and spent more time upon, and preferred to a greater extent than the control group, activities involving reading.

The gifted children tended to avoid certain types of vigorous physical play. However, the gifted group participated more often than the control group in certain active plays and games, although on the whole less frequently in the extremely active plays and games.⁹

An analysis of the data gathered by Lehman and Witty regarding sex differences of bright boys and girls shows a great similarity in activities. A closer analysis reveals that the dull boys have a higher index of social participation and prefer activities of a motor type, although there is a great deal of overlapping. Successful competition which in the end brings vicarious satisfaction is the most probable explanation for these differences in interest. The organism tries out various modes of behavior until success is attained to some degree. The bright pupil gains vicarious satisfaction in reading and is able to compete most successfully in activities requiring problem solving and thinking. The formula for both the bright child and the dull child is the same; but it seems reasonable to assume that the type of activity that satisfies the felt need of the adolescent is the one that is chosen.

⁹ Witty, Paul A., and Lehman, H. C., "The Play Behavior of Fifty Gifted Children," *Journal of Educational Psychology*, 1927, Vol. 18, pp. 529-565.

The adolescent's interest in school. Numerous investigations of pupil interests in the school subjects have been made. There are many influences which determine pupil preference for the subjects, and it is necessary to consider these. Almost any subject may be found ranking first in interest in some locality because of the peculiar vocational, economic, or social conditions. Then, too, a teacher possessing qualities especially appealing to the adolescent may cause a subject to receive attention which it otherwise would not get. Just the opposite is also true. A poor or disliked teacher often causes the avoidance of some subject which might if taught by another be studied with profit.

Of the many investigations dealing with the relative interest of students in the school subjects, only a few of the more important need be considered here. Brown and Minnich¹⁰ made one of the early investigations. The preferences of 2,097 high-school pupils were tabulated after the pupils had ranked in the order of preference the subjects which they had had or were studying. The students were also asked to list any subject which they would like to drop. An examination of the data shows that chemistry was liked best by the boys and least by the girls. English ranked highest in interest for the girls and fifth for the boys. The same authors in another investigation found that interest in a subject is a result of many factors and that it varies with localities.

The choice of subjects by the pupils in the Horace Mann School should be compared with the choices made by high-school students in Indiana. The material in

¹⁰ Brown, J. C., and Minnich, J. J., "A Study of the Preferences of Secondary School Pupils for the Various Subjects," *Educational Administration and Supervision*, 1915, Vol. I, pp. 527-545 and 599-610.

Table XX is taken from Book's study of 5,748 high-school students. While the subjects are not always listed alike in the two investigations, considerable similarity in ranking is found. Book did not differentiate between boys and girls in his investigation, and this fact accounts for much of the dissimilarity found.

Many high-school subjects, such as Latin and algebra, possess a certain novelty of subject matter which should make them interesting to almost everyone, if properly taught. As is well known, dislikes arise all too frequently. In a study of the causes of the loss of interest,¹¹ it was found that a number of causes frequently operated, but that those most frequently mentioned were subject matter, method, teacher, and administrative causes, in the order given. A study of similar situations leads to the conclusion that loss of interest or failure to develop interest is usually a result of the operation of complex causes. As was previously stated, the teacher is the key to student interest.

Mental ability and the high-school subjects. That success in the different school subjects as taught at the present time demands and thus selects students of various degrees of intelligence has been shown by various studies. Book makes the following conclusions from a state-wide survey of the seniors of the Indiana high schools: "If the sexes are combined and the groups selecting different favorite subjects are considered as units, foreign language, mathematics and science subjects are regularly preferred by the brightest seniors of the state. English and history occupy a position about midway between the language

¹¹ Young, F. M., "Causes for Loss of Interest in High-School Subjects as Reported by 651 College Students," *Journal of Educational Research*, 1932, Vol. 25, pp. 100-115.

and science groups on the one hand and the vocation groups on the other.”¹²

TABLE XX

NUMBER OF PUPILS SELECTING DIFFERENT HIGH-SCHOOL SUBJECTS AS THEIR FAVORITE STUDY. (*After Book.*)

<i>Favorite Subjects</i>	<i>Cases</i>	<i>Per Cent of Total Group</i>	<i>Favorite Subjects</i>	<i>Cases</i>	<i>Per Cent of Total Group</i>
Mathematics.....	1156	20	Latin.....	196	3
English and Lit....	1119	19	Manual Training..	147	3
History.....	683	12	Chemistry.....	144	3
Commercial.....	561	10	Music and Art....	143	3
Science.....	368	6	Agriculture.....	87	2
Physics.....	323	6	Botany.....	53	.92
Dom. Science....	292	5	Debating.....	44	.77
Language.....	240	4	No Sub. Selected..	192	3

Another investigation¹³ which is of interest in this connection undertook to find the relation between pupils' ratings of school subjects for preference and ease. Forty-eight high-school subjects were ranked by 25 judges according to the demands they were believed to make upon intelligence. The technique involved in assigning a rank to a subject is too technical and space-consuming to be considered here. It is such, however, as has been found valid in educational research. After the subjects were ranked, 309 gifted high-school pupils were asked to rate from 1 to 5, according to liking, the subjects he had taken. A rating of 1 meant that the subject was liked "very much"; 3, that it was neither liked nor disliked; 5, that it was disliked "very much."¹⁴

¹² From Book, W. F., *Intelligence of High School Seniors*, The Macmillan Company, 1922, p. 146.

¹³ Terman, L. M., et al., *Genetic Studies of Genius*, Palo Alto, Cal., Stanford University Press, Vol. I, 1925, pp. 585-595.

¹⁴ *Ibid.*, pp. 587-588.

It was found that the subjects in the mathematics group were the best liked by far, and that this was the easiest group. Other subjects which were well liked were chemistry, physics, dramatics, and sports. For these gifted high-school pupils, the art group—freehand drawing, modeling, instrumental music, vocal music, and painting—was the least liked and the hardest. The correlation between the ratings of the subjects as to intellectual demands and as to ease was $-.384 \pm .081$. *“That is, the less intelligence a subject demands, according to competent judges, the harder it is for these pupils, and the less they like it; the more intelligence it demands, the easier it is and the better they like it!”*¹⁵ On the other hand, the correlation between the per cent of pupils who rated a subject 1 for preference and the per cent who rated it “very easy” was found to be $-.753 \pm .044$. These correlations tell us that there is a close relation between interest and ability. They do not tell us whether either is cause or effect. Probably a safe assumption to make is that there is a close interrelation between them and that either may be cause or effect.

Reading interests. Studies of reading interests do not show that the same books are preferred by similar groups in different localities, but they indicate that there is a great deal of similarity in the types of reading interests of groups of similar age, sex, and intelligence from different localities.

The various studies show a keen interest in fiction among girls, while adventure stories are preferred by boys. During later adolescence (post-adolescence) there is a natural shift of girls' interests from juvenile to adult fic-

¹⁵ *Ibid.*, p. 590.

TABLE XXI

PERCENTAGE TABLE INDICATING THE RELATIVE PROPORTION OF BOOKS
CHOSEN IN EACH CLASS. (After Jordan.)

Ages		9-11	12-13	14-16	17-18
Boys.....		59	253	846	283
Girls.....		87	336	1195	414
Adult fiction.....	{ B.....	4	6	18	30
	{ G.....	15	33	45	58
Juvenile fiction.....	{ B.....	27	19	11	9
	{ G.....	67	44	30	13
Adventure.....	{ B.....	56	64	59	49
	{ G.....	12	17	18	22

tion, the trend of boys' interests being toward biography, history, travel, information of a general type, and humor; and yet there is considerable overlapping.

The interest of the girls in fiction is apparent in Table XXI. The books preferred by girls, according to Jordan's study,¹⁶ were: *The Girl of the Limberlost*, *Little Women*, Zane Grey's works, *Pollyanna*, and *Freckles*; boys listed the *Boy Scout Series*, *The Call of the Wild*, and *Treasure Island*. Even in the magazine list, Jordan found a remarkable interest in fiction on the part of girls.

The problem whether the preferences in reading of dull children differ from those of children of average and superior intelligence is an interesting one. Miriam B. Huber¹⁷ attacked this problem by giving for reading selections from children's literature representing a certain range of interests to groups of children at different levels of intelligence and under experimental conditions, and then making comparisons of their reactions and preferences. In this experiment, 430 children in 15 classes of

¹⁶ Jordan, A. M., *Educational Psychology*, New York, Henry Holt and Company, Inc., 1928, pp. 111-112.

¹⁷ Huber, Miriam B., "The Influence of Intelligence upon Children's Reading Interests," *Contributions to Education*, New York, Teachers College, Columbia University, 1928, No. 312.

the schools of Yonkers were the subjects. It was found that dull children preferred materials related to familiar experiences. They liked the humorous selections less than did the bright children. There was a great deal of similarity in the ranges of choices among types of literature by the groups.

Table XXII presents the results of a study of the magazine interests of high-school students.¹⁸ From this table we notice that *The Saturday Evening Post*, *The Ladies' Home Journal*, *Cosmopolitan*, and *The Literary Digest* ranked first, second, third, and fourth, respectively. A study of this table will show further the interests of these students in stories, current events, and humor. These results are in harmony with those taken from the studies of Jordan and others referred to in this chapter.

TABLE XXII

MAGAZINES LIKED BY HIGH-SCHOOL STUDENTS. (After Elder.)

<i>Saturday Evening Post</i>	163	<i>Woman's Home Companion</i> ...	38
<i>Ladies' Home Journal</i>	139	<i>Harper's</i>	37
<i>Cosmopolitan</i>	94	<i>McCall's</i>	35
<i>Literary Digest</i>	80	<i>St. Nicholas</i>	33
<i>Good Housekeeping</i>	73	<i>College Humor</i>	30
<i>Motion Picture Magazine</i>	56	<i>American Magazine</i>	29
<i>Collier's</i>	49	<i>Scribner's</i>	28
<i>Judge</i>	48	<i>American Girl</i>	26
<i>Liberty</i>	46	<i>Pictorial Review</i>	17
<i>Atlantic Monthly</i>	39		

Vocational interests. Interests formed early in life become habits out of which other habits are established. Those interests, developed rather fully in early life, be-

¹⁸ Elder, Vera, and Carpenter, Helen S., "Reading Interests of High School Children," *Journal of Educational Research*, 1929, Vol. 19, pp. 276-279.

come automatic in nature and are thus foundations for further interests. However, an analysis of these early interests will show that play activities, manipulating, and collecting fall into rather large categories. If a girl at ten is interested in collecting flowers, it is not necessarily indicated that she will retain this special interest—although, to be sure, there is a likelihood that she will follow such an interest more readily than would a girl of ten who is not interested in collecting flowers. Reading interests, play interests, and home sentiments are formed rather early in life. Vocational interests are more transitory because of the rapid change and growth of the child's experiences. The reasons given by a young child for the choice of a vocation are not the same as those given by an adult. A large percentage of adolescent boys will give as their choice some activity related to adventure, for theirs is a life of adventure and interest in adventure.

Vocational interests and attitudes of high-school pupils are receiving more attention today because of their importance in relation to guidance and adjustment. Hurlock made a very interesting study of the vocational attitudes of high-school boys and girls in which she used 447 boys and 685 girls as subjects. Concerning her study, she says:

In conclusion, this study of vocations selected by the different types found in American schools seems to prove that race and environment affect the student's selection. For example, the Negro boys and girls chose teaching because, as a race, these people consider it a position that gives prestige. Music was chosen only by those who had had opportunity to study, or whose heritage was the love of music. The interests and conditions of the times are also important, as exemplified by the great number of boys who would like to be aviators and girls who prefer a commercial career. The majority of boys and girls do not consider their abilities

or talents, or there would be a more equal distribution among the lines of work, and a great number of boys would select the father's vocation or one similar. A need for wise, careful guidance is made plain. Not only must the child become acquainted with the many present-day occupations, but he must be shown how to evaluate his abilities and how to find his place in the economic structure.¹⁹

Lehman and Witty²⁰ found from a study of 26,878 school children between the ages of eight and one-half years and eighteen and one-half years that there is little permanency in most vocational interests. Other interests, they point out, are probably more permanent.

A recent study by Carter and Strong²¹ compared the vocational interests of boys and girls. In the first group, they held the ages constant by using as subjects 34 pairs of twins of different sex. Certain fairly consistent differences were found. The girls showed a greater interest in occupations in which language and contact with people are more prevalent, while the boys were more interested in activities relating to sciences. It is quite likely that the advanced maturity of the girls, since age was held constant, tended to affect the results slightly, although the latter are more or less in harmony with general observations.

Proctor's²² follow-up work with 930 high-school

¹⁹ From Hurlock, E. B., and Jansing, C., "The Vocational Attitudes of Boys and Girls of High-School Age," *Journal of Genetic Psychology*, 1934, Vol. 44, p. 189.

²⁰ Lehman, H. C., and Witty, P. A., "One More Study of Permanence of Interest," *Journal of Educational Psychology*, 1931, Vol. 22, pp. 481-492.

²¹ Carter, H. D., and Strong, E. K., "Sex Differences in Occupational Interests of High School Students," *Personnel Journal*, 1933, Vol. 12, pp. 166-175.

²² Proctor, W. M., *Use of Psychological Tests in Educational and Vocational Guidance of High School Pupils*, Bloomington, Ill., Public School Publishing Company, 1923, Chap. VI.

students four years after his earlier study of their interests led to the conclusion that interests of senior-high-school students are more permanent than those of junior-high-school students. The results obtained from a recheck of the interests of the high-school pupils four years after his first study showed that the early vocational preferences had been very much modified. Earlier interests, no doubt, affect later interests, although a final vocational choice is dependent upon many variables. Furthermore, a specific interest in early life may through guidance lead in any one of many directions.

Thought Problems

1. Name some factors in a pupil's life that would determine the direction of his reading interests.
2. In what ways is a knowledge of the interests of a group of boys and girls of especial value to the teacher? Illustrate.
3. How is interest related to the choice of a school subject? To vocational choice?
4. How is interest related to intelligence? To age? To sex?
5. Study your early life interests. Do you note recurrent signs of these interests appearing in your daily life activities? What is the significance of these facts?

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CHAPTER VIII

Motivation and Learning

Students in the fields of education and psychology recognize the close relation between learning and motivation. Investigations of the relation between intelligence and achievement in educational pursuits show that factors other than intelligence are prominent in affecting educational progress. The low correlations so often found present a discrepancy that should receive further attention by those concerned with guiding and directing pupils through learning activities. The results of certain investigations show that traits referred to as "industry," "perseverance," "dependability," and "ambition" are important in relation to learning.¹ Turney draws conclusions from a statistical treatment of data gathered in a study carried out in the University of Minnesota High School. "The foregoing data indicate that the four traits, 'industry,' 'perseverance,' 'dependability,' and 'ambition' are more closely related to achievement than is either I. Q. or M. A., and that they are not closely related to either I. Q. or M. A., but that they are so closely related to each other as to show marked overlapping." Again, he writes: "It seems clear that the two major factors in school achievement are intelligence on the one hand and 'motivation' on the other."

¹ Turney, A. H., "Intelligence, Motivation, and Achievement," *Journal of Educational Psychology*, 1931, Vol. 22, pp. 426-434.

Motivation and drives. The motivation of human behavior cannot be explained wholly upon a stimulus-response ($S-R$) basis, for we must not neglect to note that the readiness of the organism to respond varies, being determined by internal physiological conditions. Hence, we may use the $S-O-R$, or stimulus-organism-response, basis. These inner changes may well be thought of as drives. Woodworth illustrates this by the operation of a machine:

The drive here is the power applied to make the mechanism go; the mechanism is made to go, and is relatively passive. Its passivity is, to be sure, only relative, since the material and structure of the mechanism determine the direction that shall be taken by the power applied. We might speak of the mechanism as reacting to the power applied and so producing the results. But the mechanism without the power is inactive, dead, lacking in disposable energy.²

Again, a drive might be looked upon as a relatively persistent inner stimulation that affects and often dominates the behavior of an individual until he gradually becomes hardened to this driving stimulation. Hunger, thirst, sex, pain, fatigue, temperature extremes, and certain manifestations related to bodily tensions are some of man's most important and fundamental drives. The dominating character of these inner drives is apparent to any student of human behavior; however, owing to the fact that they have been very much conditioned and reconditioned by various social forces, their basic nature is oftentimes referred to in terms of "organic need" and they have been further considered as the mainsprings of human behavior. Herrick gives the following thought relative to this:

² Reprinted from Woodworth, *Dynamic Psychology*, p. 37, by permission of Columbia University Press.

Each species of animal and plant is so organized that in form and functional pattern it fits into a particular niche, so to speak, in the complex world of things. The hereditary form of the species is such as to enable it to thrive in some type of situation, from which it cannot be transplanted. . . . Just as every machine must be designed to fit the use to which it is put, so the form of every animal body is observed to fit its particular functional pattern. The preservation of its characteristic form (within narrowly circumscribed limits of variation) is the condition for the continued existence of both the individual and the species to which it belongs. This form is repeated in each generation and within the lifetime of each individual there is a regulatory tendency to return to the typical form pattern if this pattern is in any way distorted. This is fundamentally an expression of momentum, for the living body is no more a static thing than is a soap bubble or a gyroscope. It is momentum of dynamic pattern, not of mass.³

Incentives. The wide use of incentives is well known by everyone who has been concerned with the guidance and direction of children. A fuller analysis of their function in learning situations will be given at a later point in this chapter. Incentives are usually conceived of as those external motivating situations that incite the organism to an increased activity. Concerning this, Leuba says: "Incentives are motivating situations which can be introduced fairly universally and frequently to facilitate any activity already in progress." Furthermore, he points out how in our materialistic development incentives and other external stimuli (either actually present or symbolized) have to a large degree replaced organic urges as dynamic forces in behavior. He lists, somewhat arbitrarily, the following as an incomplete list of objective statements of common elementary incentives:

³ Herrick, C. J., *Neurological Foundations of Animal Behavior*, New York, Henry Holt and Company, Inc., 1924, p. 280.

1. A goal, or evidence of progress toward a goal.
2. A mark of distinction, such as a medal or a title.
3. A material reward, such as candy or some golf sticks.
4. Other persons working at the same task, whose performance can be compared with one's own (rivalry).
5. Words, expressions, or attitudes of praise, approval or encouragement.
6. Words, expressions, or attitudes of blame, disapproval or reproof.
7. Words, expressions, or attitudes of attention and recognition.
8. Words, expressions, or attitudes of deference, obedience or submission (power over others).
9. Novel stimuli, such as those impinging upon the discoverer or upon anyone engaged in work of a creative nature.
10. Persons or place frequently associated with any of the above (some forms of altruism, and performance of a task for its own sake).⁴

Self-activity and learning. Every experience is an interaction between the individual and his environment, producing a change in both the environment and the individual. *Learning* is the name given to the change in the individual. Learning is, therefore, a result of individual activity directed in some specific direction. This emphasis on individual activity will also be observed in connection with attention and learning. Good teaching will only motivate the learner, insofar as individual activity is concerned. Good teaching is further designed to so organize the learning situation that the subject's activity thus directed becomes more effective. Teaching and learning have oftentimes been grossly confused. Furthermore, in the study process reading and study have

⁴ From Leuba, Clarence J., "The Measurement of Incentives and Their Effect: A Contribution to Methodology and Orientation Resulting from the Experimental Use of Incentives," *Journal of Social Psychology*, 1932, Vol. III, pp. 107-114.

often been confused. This is well illustrated from the dialogue in Shakespeare's *Hamlet*:

POLONIUS.—What do you read, my lord?

HAMLET.—Words, words, words.

The mere reading of words is not study. All study involves attentive responses to problem situations. The first essential in study is an attentive awareness of the problems of the learning situation. Meredith Smith says of this tendency as it relates to education:

The tendency to seek new contacts, to find outlet for activity in ever new and varied forms in accordance with the possibilities inherent in the organism, is recognized as the basis of the progressive development of human society. Out of surplus activity, it is maintained, invention and all forms of culture have evolved. With his potentialities for receiving excitation from a very great environmental range and for precise and varied action on the environment, the demand of the human being becomes more adequately expressed as the demand for opportunity, for self-expression, initiative, and originality.⁵

Mental set and association. The association which one makes in response to a situation is determined largely by his mental set. This mental set is a sort of readiness to make certain associations in response to a specific situation. This mental set may appear in many different conditions. Interest in a task is a sort of mental set or readiness for an attentive response to the elements of the task. An emotional tone in harmony with the impending situation will bring one to a greater readiness for responding to the situation. A case in point is the singing of patriotic songs and the displaying of flags and emblems

⁵Smith, Meredith, "Education and the Integration of Behavior," *Contributions to Education*, New York, Columbia University, Teachers College, 1927, No. 261, p. 72.

prior to a patriotic address. Again, the preceding activity gets one in a mental set for further activity within the same general pattern. This mental set as a determiner of one's attentive response follows the general principle of perceptual patterns, which was set forth in an earlier discussion. In such a case one's associations are grouped into a relational pattern, and one element of the pattern tends to bring forth other elements. Thus, if one's mental activities are within this relational pattern, a response to a certain stimulus is likely to be interpreted in terms of its possible relationship to the configuration.

Interests and motivation. One of the ultimate measures of the vitality of learned activities is the extent to which they lead to desirable interests and habits which endure into maturity. "Interest and motivation are very closely related. It is well recognized by successful teachers that when work is properly motivated and based upon the interests of the subjects it appears easier to them."⁶

Ability combined with interest in a task will lead to a very high degree of success. Interest is sometimes referred to as the "go-between," in that it links up the individual with the thing or condition involved. Some factors that are of especial importance in the development and guidance of the pupil's interests are: (1) the personality of the teacher; (2) the attitude of the teacher toward the child and the school program; (3) the home influences; (4) various environmental influences other than the home and the school; (5) the maturity of the child; (6) the organization and presentation of the materials; and (7) the child's intellectual and physical equipment.

Interests and learning. Every alert teacher recognizes

⁶ Garrison, K. C., *The Psychology of Adolescence*, New York, Prentice-Hall, Inc., 1934, p. 157.

the fact that the learner will do well at those tasks of interest to him and poorly at those that arouse in him no interest. One of the fundamental tasks of every teacher is directing the student's interests, and thus his efforts and attention, into desirable school activities. Interest is, thus, directly related to attention and learning. As William James writes: "We notice only those sensations which are signs to us of things which happen practically or æsthetically to interest us . . ." This interest varies from creature to creature, from age to age, from grade to grade, and with the sexes.

Interest is closely related to the problem of attention. The child who is intensely interested in some task will have no trouble attending to it. This form of attention has been referred to as *non-voluntary attention*; it is a sort of spontaneous attention. And attention controlled and directed by interest will lead to effective learning. The problem of active attention—which is essential for learning—is definitely related to the problem of pupil interest.

If we could accurately determine the interests of children, be those interests desirable or undesirable, it would be possible to direct those interests along lines of desirable social and educational development.

Habits as drives to action. The importance of this topic in the study of the adolescent cannot be overemphasized. Habits of a social nature are in their formative stage during later adolescence. They are simple and varied during this period, and are found to be very transitory in their general manifestations. Many mannerisms appear, being manifested in isolation from the individual's general habit patterns—which, in fact, are often inconsistent and changeable. The extent to which a habit pattern once built up becomes a drive to action will depend mainly

on the extent to which it becomes integrated in the individual's general habit patterns and finally becomes automatic.

It has been found that attentive repetition of an act tends to make for automaticity of the act. Habits are continuous rather than periodic. A habit once formed is never completely eradicated from man's neural structure, for all changes which are effected must be built upon the structural patterns existing at the time in the individual. James recognized this in his well-known classical statement:

Every smallest stroke of virtue or of vice leaves its never so little scar. The drunken Rip Van Winkle, in Jefferson's play, excuses himself for every fresh dereliction by saying, "I won't count this time!" Well! he may not count it, and a kind Heaven may not count it; but it is being counted none the less. Down among his nerve-cells and fibres the molecules are counting it, registering and storing it up to be used against him when the next temptation comes. Nothing we ever do is, in strict scientific literalness, wiped out. Of course this has its good side as well as its bad one. As we become permanent drunkards by so many separate drinks, so we become saints in the moral, and authorities and experts in the practical and scientific spheres, by so many separate acts and hours of work.⁷

Such changes as are made may become automatic in nature, but the old habit system operates under special emotional conditions when rational behavior is not so much in evidence. Even volition must be studied in terms of learning and can best be thought of in terms of man's habit system. All these habit patterns which tend to contribute to the efficiency of the human mechanism become potent drives for the initiation and direction of action.

⁷James, William, *Psychology (Briefer Course)*, New York, Henry Holt and Company, Inc., 1892, p. 150.

Definite goals. Dewey⁸ pointed out over a quarter of a century ago that it is highly desirable for pupils to do their work as active, interested workers, conscious of problems whose solution satisfies some real or felt need or which has a value attached to it. Other things being equal, work will be done far more effectively when pupils know the goal toward which they are striving. They should, therefore, have some living purpose and be motivated in the attainment of it. However, it is often well to let the real importance of the attainment of certain aims unfold itself as the learner proceeds. The gaining of information, the satisfying of curiosities, and the clearing up of problems should be emphasized. Even the facts we gain when someone directs our thoughts may be of enormous value; they may stimulate us to further active thinking. It has been pointed out that interest and ability are related in the sense that a pupil is likely to be most interested in the subject in which he succeeds the best. Therefore, a goal becomes a mark towards which to strive, a point to focus on, a director to guide one. The learner who has a definite goal in view will not be led away so easily by meaningless stimuli, neither will his attention or effort shift so readily as a result of distracting forces.

The effect of the assignment of work in relation to the achievement of pupils is important in connection with teaching procedures. It has been pointed out that good teaching consists primarily in the process of furthering learning efficiency. If the assignment can be so made as to motivate students or to aid them directly or indirectly in the learning and retention of the materials, this may be

⁸Dewey, John, *The Child and the Curriculum*, Chicago, the University of Chicago Press, 1902.

a fundamental condition in learning. Jordan⁹ attacked this problem in a study in which he used 951 pupils from Grades 5, 7, and 9 of the Durham and Raleigh, North Carolina, Public Schools.

Five different assignment procedures were used. These procedures were: (1) the pupils were instructed in looking up the meaning of difficult words and in underlining important items; (2) carefully selected questions on the materials were given to the pupils for study; (3) pupils were taught the meaning of difficult words appearing in the assignment; (4) an attempt was made to relate the materials to the pupil's personal experiences; and (5) the materials were carefully explained to the pupils as to the causal relationships involved.

The results obtained seem to indicate that the teaching of the meaning of words caused the greatest gain in word knowledge for each grade, while making pupils aware of the general meaning of the materials brought about the greatest gain in ability to comprehend sentence meaning on the part of fifth- and seventh-grade pupils. In the case of paragraph meaning, making the pupils aware of the personal relationship and value of materials produced the best results in the fifth grade, while making pupils aware of the general meaning of the material was most successful for the seventh grade. Jordan concludes:

The consistency of the gain, the fact that each type caused a noticeable gain on the part of one or two of the grades examined, the brief time for acquainting the pupils with the specific procedure used in the assignment, and the large per cent of a year's gain in many cases, are evidence of the importance of the assignment.¹⁰

⁹ Jordan, A. M., "Influence of the Assignment on Learning," *Journal of Educational Psychology*, 1931, Vol. 22, pp. 659-666.

¹⁰ *Ibid.*, p. 665.

Knowledge of progress. This phase of the problem of motivation is related to praise and reproof, in that knowledge of success is somewhat comparable to self-praise. Paulasigui and Knight¹¹ report a recent experiment conducted with two groups of fourth-grade pupils who worked on a series of drill units in the fundamentals of arithmetic. One group was provided with progress charts while the other group was given no such materials. The two groups were equivalent on initial arithmetic tests; but the group that used the progress charts made gains over the group that were statistically reliable.

Their results are similar to those found by Ross¹² in an experiment in which he had 59 college students perform the simple sensori-motor act of making groups of four vertical lines and crossing them with a fifth. These subjects were divided into three equivalent groups.

One of the groups was given full information concerning their progress from day to day, the second was given only partial knowledge of results, while the third had no information whatsoever as to their progress. The only factor which seems to have been variable was that of knowledge of one's individual progress. Results from this experiment show that progress is directly affected in a positive way by the knowledge that one has of the score made. This was found to be true both for speed and accuracy.¹³

However, a more recent experiment by Ross¹⁴ in which

¹¹ Paulasigui, I., and Knight, F. N., "The Effect of Awareness of Success or Failure," in *The Twenty-Ninth Yearbook of the National Society for the Study of Education*, Part II, 1930, pp. 611-621.

¹² Ross, C. L., "An Experiment in Motivation," *Journal of Educational Psychology*, 1927, Vol. 18, pp. 337-346.

¹³ Garrison, S. C. and K. C., *The Psychology of Elementary School Subjects*, Richmond, Johnson Publishing Company, 1929, pp. 174-175.

¹⁴ Ross, C. L., "The Influence Upon Achievement of a Knowledge of Progress," *Journal of Educational Psychology*, 1933, Vol. 24, pp. 609-619.

school materials were used did not show that knowledge of progress was so important. He points out in connection with this later experiment that mature students on certain types of meaningful materials were to an extent aware of progress or failure to progress whether definite data were given them or not. This would, then, affect the scores in a manner similar to an actual presentation of their amount of progress.

Bolt¹⁵ studied this problem in relation to the increase of production when information of output was supplied. He found, partly through the use of this motivating in a training program for Hollerith machine operators, that production was more than doubled.

Closely related to knowledge of success as a motivating force is the *clear recognition on the part of the learner of the purpose and value of the materials being learned*. The vitality of an activity is determined in a large measure by the extent to which the person recognizes its relationship to life activities. Meaningful and worthwhile experiences that are in harmony with the abilities and interest of the learner will not need some extrinsic and superficial motivating force.

Educational tests. Educational test scores may be used in such a way that they act as a motivating stimulus for learning. Pupils may be given their record on standard tests from time to time and be shown how to chart their own progress. This gives them their progress in learning, and, as we noticed, learning is superior when knowledge of results is given to the learner. Success is satisfying and leads to further effort and, thus, increased

¹⁵ Bolt, R., "Das Prüfen und Anlernen von Hollerith Locherinnen," *Psychotechnisches Zeitschrift*, 1931, Vol. VI, pp. 19-36 and 45-49.

learning. A recent experiment by White¹⁶ is of special interest in connection with this problem. White used as subjects three sections of college students in general psychology. He divided the students into experimental and control groups by taking the even-numbered ones of each section for the experimental group and the odd-numbered ones for the control group. The instruction, assignment, length of period, and such factors were, therefore, held constant. The students were told at the beginning of the course that the final grades for the control group would be based wholly on weekly tests, and that the final grades for the experimental group would be based fifty per cent on the weekly tests and fifty per cent on the final examination, which would consist of the same true-false statements given in the weekly tests. The students were also given a completion test in the final examination as a check upon the validity of the true-false tests. The results indicate "that the superiority of the experimental group over the control group in the [weekly] completion test is approximately equal to the superiority of the former over the latter in the final true-false test." Also, the final completion test, with which the students were not familiar, likewise showed a superiority for the experimental group. The superiority as determined by the final tests was 51.15 per cent. The results of this study are in harmony with the results of other studies, namely, pupils tend to achieve more when there is a general realization that they are going to be examined at a later time on the materials studied.

Praise and reproof. The relative value of praise and reproof as motivating factors is very important, since these

¹⁶ White, Huber B., "Testing as an Aid to Learning," *Educational Administration and Supervision*, 1932, Vol. 18, pp. 41-46.

forms of motivation are constantly used in relation to various learning and performance situations. Elizabeth B. Hurlock¹⁷ attempted to compare the outcome of learning in groups one of which was praised and the other reproofed. She had as subjects 106 children from the fourth- and sixth-grade classes, and from these four equivalent groups were formed. In the one group, the children were called by their names and praised before the rest of the class; in a second group, they were called by their names and reproofed for their poor work; those in a third group were completely ignored, although they were in the room and heard the praise or scolding given the others. A fourth group, the control group, were in another room and were unaware of the treatment being accorded the other groups.

The results of this experiment indicate that both praise and reproof are effective as incentives. However, a further analysis revealed that within the groups reproof was more effective for boys than for girls; also, that inferior children were more responsive to praise, while the superior children were more responsive to reproof. "Increased accuracy was found only in the work of the children who were praised or reproofed." Thus, from these results one would conclude that praise is in general the superior incentive. The experimenter concludes further: "Reproof, when first used, seemed to be about equal in value to praise, but with continued use its effectiveness showed a decided decline. To ignore children in a group where the other members are receiving some incentive is psychologically bad."

¹⁷ Hurlock, Elizabeth B., "An Evaluation of Certain Incentives Used in School Work," *Journal of Educational Psychology*, 1924, Vol. 16, pp. 145-159.

These results are in harmony with results earlier obtained by Gilchrist¹⁸ in an experiment in which college students in educational psychology were used as subjects. Further studies carried out at a still earlier date by Kirby with 1,350 pupils from the third and sixth grades, in connection with addition, reveal the same general conclusions. According to these findings, the positive method of control in the case of motivation is the superior one; further studies relative to the development of desirable attitudes and character qualities will lend further support to this concept. The success of praise as an incentive is to be traced to satisfaction and, thus, the release of tension and the development of a driving tendency in relation to the problem situation. Boys and girls will exert themselves to the utmost to win the approval of a master, teacher, parent, or friend whom they admire. This approval is definitely related to success, and it seems to be true in life that nothing breeds further success like the first taste of success. The boy or girl who meets reproof at every turn, even in response to efforts, will soon have very little incentive to push on. He has developed habits of looking for failure, and his likelihood of overcoming problem situations is much less than would be the case if he had developed the habit of attacking the task with the spirit that he would ultimately win.

Punishment and reward. Studies made of the potency of certain incentives when applied to actual schoolroom conditions show that many of the incentives frequently used have very little value,¹⁹ especially in the matter of

¹⁸ Gilchrist, E. P., "The Extent to Which Praise and Reproof Affect a Pupil's Work," *School and Society*, 1916, pp. 872-874.

¹⁹ See Warden, C. J., and Cohen, A., "A Study of Certain Incentives Applied Under Schoolroom Conditions," *Journal of Genetic Psychology*, 1931, Vol. 39, pp. 320-327.

eliminating undesirable forms of behavior. There are several techniques by means of which undesirable behavior may be reconditioned. Probably the most commonly used method is the association of an undesirable experience with the undesirable behavior act. The various types of punishment meted out to pupils because of certain forms of behavior may be so classed. These procedures are sound psychologically; but there are certain conditions to be avoided, or else the results obtained may be very undesirable. In the case of the motivation of learning, the following general principles should be adhered to: first, the annoyance should be felt rather soon after the undesirable behavior is committed; second, the annoying situation should have some logical relation to the behavior act; third, the annoyance should not be administered in a spirit of anger; fourth, the certainty of the annoyance is of more importance than its severity; and fifth, the activities of the one administering the annoying situation should be impersonal in nature.

Somewhat antithetic to this technique is the one in which a desirable experience is associated with a more desirable form of response. These two techniques are closely related to reproof and praise as motivating forces. However, the emphasis here is on the eliminating of habits already established. Again, this principle is psychologically sound, but must be used discriminately. The principles suggested in the preceding paragraph in connection with annoying situations, if modified to suit the latter technique will operate very effectively.

Thorndike's recent experiment is of interest in relation to this problem. The learning activity consisted of choosing from a list of five English words the correct translation for a particular Spanish word. This procedure was fol-

lowed for 200 words. The results of the experiment indicated that a reward, whether it be a concrete one or a verbal one in which a person's pride and self-respect are appealed to, strengthens the tendency to which it is attached. On the other hand, punishment of the opposite type does nothing beneficial. Indeed, a wrong response, although punished, often does more harm by occurring than the beneficial effect of punishment does good.²⁰

Thorndike does point out, however, that punishment may under suitable conditions motivate learning. Punishment of the subject for a wrong move at the time it is made that impels the learner to follow the right move and that shifts his attention, by attaching it directly to the tendency, to the avoidance of that tendency may have a favorable influence. Unless punishment is directly related to the tendency or act in the mental attitude assumed by the learner, it is likely to be more harmful than beneficial. Concerning reward, it is pointed out that the beneficial influence is more direct, more general, and more reliable in nature. "A satisfying after-effect of a tendency acts then and there to strengthen the tendency and it acts rather independently of special conditions. It can nearly always, perhaps always, be trusted to operate."²¹

Competition. The value of competition as a motivating force will depend upon its nature and the use that is made of it. There is no doubt but that the constant glorification of success over one's associates may lead to some very harmful results. This philosophy in the business world has led to a "dog eat dog" procedure, and has aided in breeding greed and selfishness. As a procedure in

²⁰ Thorndike, E. L., "Effects of Punishment and of Reward," *Psychology Today*, Chicago, University of Chicago Press, 1932.

²¹ *Ibid.*, p. 229.

school tasks, it is likely to aid in developing antisocial personalities or mental hygiene problems. It is in connection with competition between individuals in which the "win at any cost" idea is indirectly fostered that these dangers exist.

Competition with one's previous record is probably the most desirable type of motivation for more mature learners. This is the principle present in the use of "knowledge of results" and "standard tests as a means of motivation."

The value of competition of the sexes as a motivating force was studied by Forlano.²² This investigation involved 34 school children whose median chronological age was 11 years, 9 months, and median mental age was 12 years, 8 months. The problem involved was the investigation and comparison of work done under the motives of individual competition and group competition. He compared the work performed in cancelling e's from printed letters when the subjects were motivated by the following factors: (1) working for self, (2) working for class, (3) teamwork, and (4) sex competition. He concluded, "There is a tendency for the average child to work with greater zeal and efficiency for personal gain than for the sake of helping his class, or even his team, although for the latter the difference was not as great." He concludes further, "It appeared that the motive of self-competition at this age was distinctly stronger than personal gain."

Motivation in relation to intelligence. In a consideration of the problem of motivation as it relates to ability, we are confronted with the motivation of the inferior and superior individuals. It is often stated, probably with

²² Forlano, George, "An Experiment in Cooperation," *Journal of Educational Research*, 1932, Vol. 25, pp. 128-131.

some truth, that the activities of a group in which nature designed different individual levels are usually adjusted to the level of the average child of the group. Thus, the motivation of those individuals who deviate considerably from the average becomes a very important problem for consideration.

a. *The superior child.* The general recognition of the needs of the superior individual has come about within recent years. The fact that the superior child is able to compete successfully with the average of the group led many educators and others interested in the problem of teaching and learning to neglect the further motivation of these children with superior ability. In reality, they were in many cases not even recognized, and if recognized were often misinterpreted. Probably the most natural picture of the superior child is that of an individual who is able to do mental tasks without the expenditure of a great deal of time and energy. It is in a large measure owing to this fact that such low correlations are usually obtained between intelligence and accomplishment. This is further shown by a study of the A. Q.'s of groups of subjects comparable in age, grade, and other factors but unequal in mental capacities.

b. *The inferior child.* When we study the pupil who is classified on mental tests as "borderline," "feeble-minded," or rather definitely subnormal, we are confronted with an entirely different problem. The task here is not to find more work for the individual to do, not to try to urge the individual to still more difficult accomplishments; rather, the situation calls for almost the opposite procedure. For the dull child, the task of the teacher or one concerned with aiding and motivating him is one of encouragement instead of scorn. The dull child needs

to be protected from the discouragement that he is constantly meeting in all his efforts. For him, success is an unusual experience. The dull child most often meets with failure at his various school tasks. His attitude, as he approaches a new problem, is that he will be unable to solve the situation. He should be guided into easier materials and shown the possibilities of success. This sense of interest on the part of his teacher will be a real, motivating factor.

Needless to say, the dull child will not respond to as abstract a form of motivation as will the bright child. The dull child must see the concrete benefits that are to be attained from the doing of the task. At the present stage of experimental study, it appears quite likely that the dull child is appealed to on the basis of inherent physiological forms of motivation to a much larger degree than is the case for the bright child.

Habit and learning. In the previous chapters, it was pointed out that the problem of differentiating clearly between unlearned and learned behavior is not a simple one. Man's learned behavior is directly related to his experience; therefore, the learned element of human behavior enters into the activity of the child in the very earliest stages of life. Little is known concerning the behavior of the child during his prenatal life, although it is known that, even during this stage of life, muscles are developing, the organism is maturing, and probably certain random movements are becoming integrated into habit patterns.

Concerning habit formation, two quite universal misconceptions have developed. The first misconception is in relation to the simplicity and fatalness of the act. The habit in this case is quite often thought of as a very simple

act, inevitable and invariable in its characteristics, and comparable to a machine in its construction. Habits when considered in this manner are quite often explained wholly as a result of the repetition of a performance. The second misconception relates to the scope of the conception of habit. Habit is too often considered only in relation to motor activity or to some pathological manifestation of activity. An illustration of the first type would be that of handling a ball, while an illustration of the second type would include such habits as the drug habit, alcoholism, and so forth.

Concerning the nature of habits, Watson said, some years ago, "Any definite mode of acting, either explicit or implicit in character, not belonging to man's hereditary equipment, must be looked upon as a habit. . . . The new or learned element in habit is the tying together, or integration, of separate movements in such a way as to produce a new activity."²³ This unitary activity to which he refers comprises the everyday acts of life, the manner of general response, and thus may include anything from the simplest modes of activity to those extremely complex.

From a study of the nature of habits, it is to be noted that they are closely connected with learning. One is a supplement to the other. The formation of a habit is really a process of learning. On the other hand, nothing is actually learned, in the fullest sense of the word, until it has become a habit. On the physiological side, both learning and habit depend on certain neural conditions in the organism.

²³ Watson, John B., *Psychology from the Standpoint of a Behaviorist*, Philadelphia, J. B. Lippincott Company, 1924, pp. 291-293.

Thought Problems

1. How would you differentiate "motivation" and "drive"? Give examples of each.
2. Look up the definition of *morale*. Discuss the value of good morale in a school situation.
3. List a large number of positive motivating stimuli. List some negative ones.
4. Give various forms in which reward and punishment are used as motivating stimuli in learning.
5. The use of praise, ridicule, sarcasm, and the like:

Miss Smith was an inexperienced teacher in the West Side Grammar School. She felt that her pupils lacked proper motivation. She decided to talk the matter over with Miss Roberts. Miss Roberts had taught the sixth grade in a small city system for a number of years and was generally considered to be a successful teacher. Her room was always orderly, and the pupils were well drilled in the fundamental subjects. In reply to a question asked by Miss Smith, Miss Roberts stated that she did not often employ praise, because, in her judgment, praise made pupils content with rather meager accomplishments.

Later in the year, Miss Smith registered in a college extension course, where she heard the teacher commend praise very highly as a means of motivation of pupils. The teacher cited several scientific studies in which it was found that praise had succeeded better than any of the other forms of motivation tried.

Miss Smith had been very favorably impressed by the conversation that she had had with Miss Roberts, and was now very much confused.

(a) Rank (1) punishment, (2) praise, (3) censure, and (4) ignoring the pupils' efforts, in their probable order of merit as means of securing zeal and willing co-operation on the part of pupils.

(b) Do experiments show that boys and girls are equally responsive to these four types of motivation?

(c) Which has more effect upon bright pupils, praise or censure? Which on dull pupils? Cite evidence from your own experiences for your conclusions.

(d) How do the results of Miss Smith's experience harmonize with the thoughts of this chapter?

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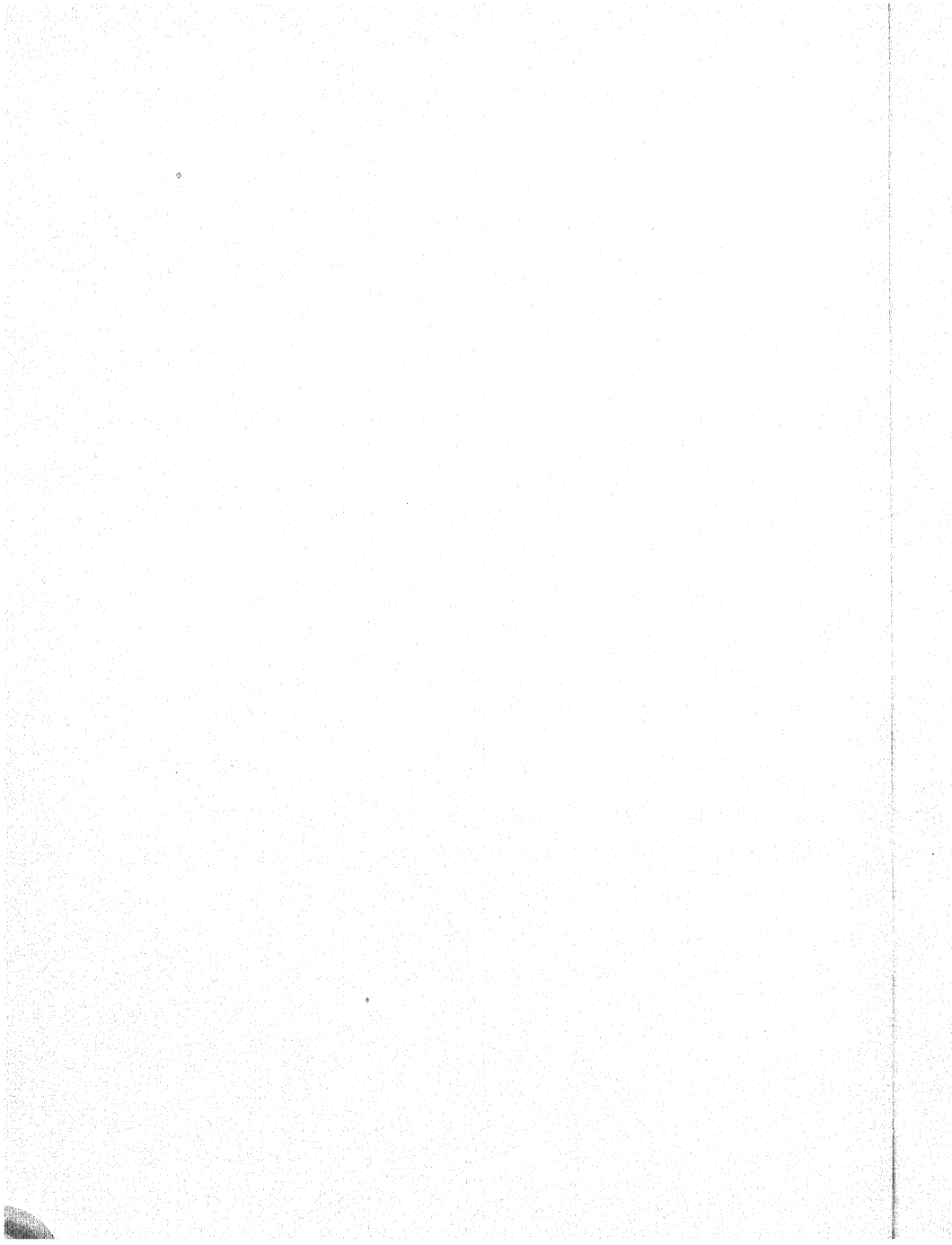
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For a splendid summary of the studies on learning and motivation, see: Hurlock, E. B., "The Psychology of Incentives," *Journal of Social Psychology*, 1931, Vol. II, pp. 261-290; and Disrens, C. M., and Vaughan, James, "The Experimental Psychology of Motivation," *Psychological Bulletin*, 1931, Vol. 28, pp. 15-65.

PART II

The High-School Subjects



CHAPTER IX

The Curriculum

Early education in America. During the early development of the United States, when a comparatively small number of people were scattered over our immense country, the educational aims were based largely upon the traditions of culture and "learning" brought over from the countries abroad. "Culture" did not mean the harmonious development of all the child's faculties, but rather the storing up of facts and the acquiring of knowledge.

Learning did not mean finding out about the things around them or about what was going on in other parts of the world; it meant reviewing the achievements of the past, learning to read the dead languages: the deeper the language, the greater the reputation for learning.¹

The preparation for life after death was especially prominent in the early period of American education. Martin Luther had earlier stated that the ability to read the vernacular is one of the prime aims of education. He wished to have the Bible read by the masses, and this was his chief educational aim. The following statement taken from the law of Massachusetts of 1647 will bear out this early religious aim:

It being one cheife proiect of ye ould deluder, Satan, to keepe men from the knowledge of ye Scriptures, as in formr

¹ Dewey, John and Evelyn, *Schools of Tomorrow*, p. 166. Published and copyrighted, 1915, by E. P. Dutton and Company, Inc., New York.

times by keeping ym in an unknowne tongue, so in these latttr times by perswading from ye use of tongues, yt so at least ye true sence and meaning of ye orginall might be clouded by false glosses of saint seeming deceivers, yt learning may not be buried in ye grave of or fathrs in ye church and commonwealth, the Lord assisting or endeavors, . . . ²

Educational aims and the curriculum. The aims and functions of education are much the same for all levels of the school system. The evaluation of a program should be a measurement in terms of criteria based on philosophical aims and functions and on the actual achievements in the subject-matter fields. According to Koos,

The final test of a subject of study must always be the extent of the contribution toward achieving the goals of the institution in which it is given. The criteria by which the courses going forward in the secondary schools are to be judged, are the purposes of secondary education.³

The general aims and functions of secondary education as outlined by a committee appointed by the National Education Association for investigating the problem are: ⁴

Aims:

1. Civic-social-moral responsibility.
2. Recreational and esthetic participation and appreciation.
3. Occupational efficiency (inclusive of preparation for higher institutions for those planning to continue their education).
4. Physical efficiency.

Functions:

1. Achieving a democratic secondary education.
2. Recognizing individual differences.

² Cubberley, E. P., *Readings in the History of Education*, Boston, Houghton Mifflin Company, 1920, p. 299.

³ Koos, Leonard V., *The American Secondary School*, Boston, Ginn and Company, 1927, p. 366.

⁴ *Ibid.*, p. 163.

3. Providing for exploration and guidance.
4. Recognizing the adolescent nature of pupils.
5. Imparting knowledge and skills in the fundamental processes.
6. Testing transfer of training (with guarded acceptance).

Modernizing the curriculum. With this enlarged function of the school and the newer biological conception of the individual as a unitary whole, there has come a demand for a curriculum more in harmony with the life of today and of tomorrow. With the social and economic transformation that is now operating, it is necessary for educators to determine the next steps in curriculum construction. Some sound and constructive guiding principles to follow have been presented by Hullfish. These are:

(1) It is reasonable to expect the school progressively to orient the student in the life of which he is a part.

(2) It is reasonable to expect the school to provide situations for the purpose of leading the student progressively to direct his action by an integrated and unified attitude to which he increasingly gives his allegiance.

(3) It is reasonable to expect the school to encourage the development of independent interests, intellectual, esthetic, or practical, on the part of its students.

(4) It is reasonable to expect the school to set up an environment in which all of its members, through active participation in its organization and control, may move progressively to a more complete appreciation of the deeper significance of the democratic way of life.

(5) It is reasonable, finally, to expect the school to face frankly the fact that it will not contribute significantly to the reconstruction of the social process until it launches a positive program of experimentation directed toward the reconstruction of its own procedures.⁵

⁵ From Hullfish, H. G., in *The Educational Frontier* (W. H. Kilpatrick, ed.), p. 163. Used by permission of D. Appleton-Century Company.

A modernized program will be a program reconstructed from our present curriculum, but focused upon social and economic problems that we are now facing. An examination of the progress that has been made in curriculum construction during the past decade shows that much has been done. Offerings in schools have changed and expanded. The program has been made more elastic and flexible in nature, standards have been set up, and scientific approaches to curriculum-making have been instituted. But, with all this progress, our curriculum has not kept pace with the advancements in our physical and social civilization. Sumstine gives a picture of this condition, and points out that, because of our failure in citizenship training, a more modern curriculum should be constructed—one which will be focused directly on citizenship training. He says:

The modern curriculum must be so organized and integrated that each part of it makes some contribution to the development of good citizenship. Citizenship is concerned with political, social, and economic conditions. These conditions must form the basis for much of the modern curriculum. The usual textbooks in the social studies provide informational material, but information alone will not develop the desirable habits and attitudes that good citizens should possess. The new curriculum must also provide other means for citizenship training, such as: (1) school and class organization; (2) the development of citizenship ideals through discussion and expression; (3) the development of citizenship habits through pupil responsibility and practice; (4) recognition of individual examples of good citizenship; (5) contributions to good citizenship from the general program of studies; (6) community activities projects; and (7) cooperation for community betterment.⁶

The dependence of curriculum values upon pupils. This is probably the most controversial of all problems of

⁶ Sumstine, D. R., "Modernizing the Curriculum," *Pittsburgh Schools*, 1933, Vol. VII, pp. 224-225.

curriculum construction. At one extreme there are those who contend that the school activities should grow out of the natural interests of children, while at the other extreme it is asserted that the activities of the child should be socially useful. At these extremes, the value of materials would receive first consideration.

Pupil self-realization should be an important consideration in any evaluation of curriculum materials. The adaptation of the pupils to the curriculum is essential if there is going to be an effective educational process at work. The pupil's previous experiences, his hereditary background, the general conditions present, and the interests which he manifests are valuable criteria for evaluating a curriculum to determine its effectiveness in providing for self-realization.

A curriculum that fails to take into account the pupil's past experiences is likely to be so out of joint that the learning process dependent upon it is very slow and the motivation in it very poor. This is directly related to the problem of articulation referred to on page 180. The pupils' capacities for work were discussed in connection with the problem of individual differences. This problem becomes all the more important as an increasing range of abilities are found in our secondary schools. A pupil will quite often through extraordinary effort memorize a mass of materials and thus appear, because of certain formal responses, to have mastered his assigned task. This memorization, however, does not provide for self-realization, neither does it indicate proper adaptation to the school materials.

The dependence of curriculum values on contemporary life. There are two problems of the curriculum which are ever pressing, in so far as they relate to culture. In

the first place, there is a necessity for *permanence*. Permanence in the curriculum materials is essential for the continuity of a particular culture that has been established through the ages. The other element is *change*. It is truthfully stated that "without change there is no progress." Change is essential for the progressive development of a particular culture. An important problem, then, is an examination of our existing culture and a study of the new in order to better evaluate materials in the light of contemporary life.

There is today a new emphasis in secondary education. This new emphasis is due largely to changes in home and community life that have come about as a result of the educational and industrial developments of the past century. Formerly, a boy or girl went to school merely to study subjects and to prepare for a professional career or a life of leisure. Problems related to his manners and morals, his interests and ambitions, his character and personality were left to such agencies as the home, the church, and the community at large. With the decline of the influence of the home and the church, the schools suddenly found that they received not only students of Greek and Latin, mathematics, history, and science, but also boys and girls in a very critical period of their development. Symonds says of this changed condition:

These pupils, in contrast to the more or less selected and homogeneous school population of a few decades ago, are as diverse in their abilities, interests, and capacities for adjustment as the population itself, and they are in need of guidance through the maze of curriculum offerings and vocational opportunities that did not exist under simpler conditions. In short, the tendency toward subject specialization in secondary education eventually ran to such extremes that it was necessary to go back to the first principles and look at the pupil as an individual. Schools found that they

were responsible for the education of the whole child and not just a part of him.⁷

Psychological principles underlying the selection of subject matter. The one underlying principle of all curriculum-making is that the nature of the learner and of the world in which he lives should determine the materials of instruction. In reality, this relates to the learner because the nature of the world—man's social institutions—is a result of man's ability to learn. However, the child is born into a situation in which the social institutions are fairly definitely fixed, and it becomes necessary for him to learn to understand them and to adapt himself to them. In one sense, all teaching is fundamentally social in purpose, because all the activities of an individual have some social significance.

The educational and social psychology of the child must be considered in the selection of the materials of instruction in any field. Curriculum-making must consider the native and acquired abilities, the interests, and the needs of the child. That the abilities of the learner must receive consideration in the selection and arrangement of subject matter is universally accepted. That his interests and needs must be taken into account is also accepted. However, different interpretations are given to the use of the needs and interests of the child.

Curriculum-making must be related to the needs and interests of the child at every turn, but it certainly is absurd to hold that the curriculum should be built out of only those materials which are of immediate interest to the child and for which he has an immediate need. The immediate interests and needs of the child must be used

⁷ Symonds, P. M., "Diagnosing the Personality of High School Youth," *Harvard Teachers Record*, October, 1932, p. 155.

in developing other interests and needs of a worthwhile nature. In other words, immediate interests and needs furnish the starting point for guidance from which the skillful teacher will work, using materials of instruction so as to promote additional growth—not the end point for which materials are selected because they happen to meet these immediate interests and needs.

Dangers of over-standardization. Many educators become so interested in what the child is studying that they lose sight of the child. The child is thus twisted and molded in an attempt to fit him into a standardized pattern. The dangers of over-standardization are apparent when we consider the varying interests, abilities, and needs of the pupils that appear in our secondary schools. To set up a rigid standard and hold this out as something sacred gives a false emphasis to educational materials. The school's function is to train students rather than aid in the operation of some smooth, standardized mass of materials referred to as "the curriculum."

A proper regard for individual differences leads one to doubt seriously the desirability of applying research methods in so rigid a manner to the determination of curricular materials. To construct a "blueprint of a socially efficient citizen" and decree that each child's career shall be guided and directed according to such a "blueprint" is a notable example of a failure to recognize that every child is to a degree unique. Such a procedure fails to consider the child's capacities, interests, maturity, and needs according to his daily experiences.

Articulation between the elementary and secondary school. One test to which every curriculum should be subjected is, "Does it provide for the progressive educational development of the child from one educational unit

to the next?" The entire school personnel tend to affect this problem of the articulation of the various levels of work. Some of the most important of these levels relating to the curriculum will be considered here.

The first consideration refers to the question, "Is there a sound and adequate educational philosophy in operation by the teachers and administrators?" Are the larger aims and the general ultimate goal of education realized by the teachers and administrators? It is not only unnecessary but probably not advisable for everyone in a school system to be in absolute agreement on the minute problems in a philosophy of education. But there should be a rather general agreement throughout the personnel of a particular school system on the major philosophy of the purpose and procedures in education. An articulated curriculum is impossible when the teachers at the various levels work according to totally different philosophies. Articulation is well-nigh impossible in a system in which the teachers at one level start with the child's nature and needs and those at another level proceed from the subject as a center and attempt to give the child so much subject matter within a unit of time regardless of his present nature and past experiences. Although the past century has brought the educators, especially the elementary teachers, to a better recognition that the child is the school element that should receive first consideration, there are still many teachers in our secondary schools and more in the colleges who proceed from subject-matter centers and are interested primarily in having everyone master a given area of subject matter. Such teachers fail to recognize the importance of the problem of individual differences in our high schools and the present-day aims of edu-

cation, following a philosophy that serves a chosen few. They have a vague concept that some good is nevertheless being done the large group of those who cannot adjust to a one-track form of a standardized curriculum.

A second element related to the problem of articulation is the relationship of the personnel of a school system. Open forums, teachers' discussions, opportunity for visits, the advancement of a teacher into another grade unit, and other means of leading the secondary-school teacher to see in a better manner the educational procedures and materials used in the elementary grades will aid her in better understanding the past experiences of the pupils, and thus should prove valuable in better articulating the work. This problem is further related to the problem of the correlation of materials.

The course of study may be a very valuable means of aiding in articulating the work of the elementary and secondary schools. Sometimes gross discrepancies exist, owing to the textbooks in use in the elementary and secondary schools. These discrepancies are an outgrowth, in part, of the development of the course of study for the different units at different times, and of the further condition of having the textbooks and course of study controlled by two different groups without any provisions for the integration of the materials. The dangers of undue repetition, important omissions, and failure in relating materials would be very much minimized if the course of study for any subject were developed by a committee representing all levels of instruction and under the general direction of one who viewed the educational program as an integrated whole. It is said that Thomas Jefferson laid down the challenge, "Let us keep our eye steadily on the

whole system," to the educators of Virginia more than a century ago. This should be the challenge thrown out to those in charge of our curriculum today.⁸

The disintegrating influence of the college entrance requirements upon the high-school course of study still exists but is slowly and most assuredly waning. The recognition of the need for a unified philosophy of education along broad lines is being recognized by those in charge of educational programs. The necessity of a better understanding on the part of the teaching personnel of the pupil and his earlier educational experiences should also lead the teacher of a special subject to see the educational process as a unitary one.

Curriculum differentiation. An examination of the provisions in our curriculum for differentiation will reveal that in many cases this differentiation is only a make-believe one. For many so-called "curriculums," the differentiation is only a matter of a choice between two subjects, for example, Latin and French, or between an additional year of mathematics and one of physics. Many schools have established two curricula, an academic one and a general one. The difference between these, however, is in many cases a matter of whether there will be a minimum or maximum of the traditional materials in the last two years of the school program. In many cases, the differentiation is a matter of whether the student will elect some vocational materials rather than a modern language or some science. A notable example that has come to the attention of one of the writers is the custom of allowing boys to elect a year of home economics

⁸ Edgett, Lucile M., "Some Phases of Articulation Between the Elementary, Junior, and Senior High School," *Baltimore Bulletin of Education*, 1934, Vol. 13, pp. 67-70.

work developed with this in mind, or, in the case of girls, of allowing the election of a year of typewriting.

Differentiation of curriculum materials on the basis of interests has been attempted in the Oliver P. Morton High School, of Richmond, Virginia.⁹ That is, the pupils are differentiated into different curricular groups and thus pursue lines of activity somewhat in harmony with their educational and vocational interests. This basis of grouping is furthermore the philosophy behind a great deal of the unit work in the "progressive education" movement. With the application of this basis for differentiation to the heterogeneous population of the senior high school, the following procedure was used for the English work in the Oliver P. Morton High School:

We began with the English course of study and divided it throughout into two paths: what we call the *A* path and the *G* (general) path. In the *A* path we left the classics, the grammar, and the composition usually considered profitable for those who are preparing for college. In the *G* path we eliminated the grammar, restricted composition to oral work and paragraph-writing, and in literature sought primarily to raise the level of appreciation in contemporary reading—newspapers, magazines, short stories, familiar essays.¹⁰

a. *Adjusting the curriculum to the handicapped.* Examination of curricula for provisions for all deviates reveals a great lack of such. In this connection Witty presents some data of interest. He says:

For example, a conservative estimate shows that there are 300,000 crippled children in the United States. Special education appears essential for about one third of this number. Less than 15,000, however, are being provided for

⁹ Cline, E. C., "Interest Grouping," *Junior-Senior High School Clearing House*, 1931, pp. 161-163.

¹⁰ Cline, E. C., "Differentiating Secondary Education," *School Review*, 1934, Vol. 42, p. 433.

through the public schools. There are at least 50,000 children who need special education because of defective vision; 5,000 (10 per cent.) only are cared for in our 350 special classes; 348 of these classes are located in cities. The deaf are infrequently provided for in 64 residential and 114 public schools for the deaf.

Two to 6 per cent. of the general population are decidedly restricted in potentiality for mental development. Nevertheless, only 15 states have enacted special laws to promote identification and care for this large group. A study for one state showed that less than 6 per cent. of the estimated number of feeble-minded are being given any kind of special educational provision at public expense.¹¹

The first need in dealing with all exceptional children is that of identification. Since the development of measurements in education to so large a degree, there are at hand various instruments that are valuable in this respect. Chapter XIX, dealing with measurements in secondary education, gives an introduction to some of this work. The next problem closely related to that of identification is diagnosis. A better understanding of the nature and amount of these variations is indispensable to an intelligent understanding and treatment of these atypical pupils. Any program devised for these pupils should be based upon a process of careful identification and diagnosis.

Elasticity in school demand and freedom to develop individuality are essential in the new school, if maximum growth is to take place. Uniformity and excessive conformity are foes to growth. Outmoded codes must be abandoned, and we should aim, through cooperative reconstruction of experience, to develop more adequate values. In this process of creation, cooperative endeavor is a most important determiner of growth. Mechanical drill and compulsory "learning" of subjects having little or no present meaning should be replaced by the whole-hearted purposive

¹¹ Witty, Paul A., "Enriching the Life Experience of Exceptional Children," *School and Society*, 1934, Vol. 39, p. 102.

activities that have a vital grip in the present interests of children.¹²

b. *Enriching the curriculum for the gifted.* Surely our greatest natural resources are those mentally gifted boys and girls who are to be the leaders of tomorrow. Our school leaders have been severely criticized by educators and psychologists within recent years because of their failure and neglect to care for this group of children. Exceptional abilities in practically all of the school activities will be found. In the case of a mechanical class of 51 students in the eighth and ninth grades of a school with which one of the writers is acquainted, scores on an objective test devised by the teacher under the writer's supervision ranged from 8 to 32. The maximum score that could be obtained was 38. Some students are able during a study period to complete an assigned piece of work very satisfactorily in less than one-fourth the time required by other students. Various means are used in providing for the superior abilities that are found in practically all of the school activities. Some means most commonly used are:

1. The use of the individual problem method; the use of more individualized instruction.
2. Variation in the amount of work that a student may carry, with extra time given to the work he is taking.
3. Promotions by subjects rather than by grades.
4. Differentiated and extra assignments for the superior student.
5. Differentiated curriculum materials with materials of a more abstract nature for the superior pupil.

¹² *Ibid.*, p. 106.

6. Free laboratory periods for work on extra materials after completion of the assigned materials.

Curriculum provisions in secondary schools with different-sized enrollments. One of the handicaps of the smaller high schools is that of not being able to supply a wide range of materials to provide for the different abilities and interests of the pupils. In the smaller high schools which are somewhat typical of a large number of consolidated rural schools, the enrollment is not sufficient to enable the school to provide for a choice of several curricula. Table XXIII presents data obtained from 838 high schools of all sizes.¹³ The general curriculum and college preparatory curriculum are the curricula most commonly offered. In the case of the larger high schools, the commercial curriculum is almost universally offered. The average number of curricula offered increases with the enrollment, the average number varying from 2.33 in the high schools with an enrollment of 100 or less to 4.50 in the high schools with an enrollment of from 501 to 1,000.

Ninety-seven out of 838 of the high schools limit certain subjects to pupils of superior ability, while 105 of the high schools limit pupils of low ability to a special type of curriculum. The vocational types of curriculum are the ones most often provided for the pupils of very low ability, while the general curriculum is also used to take care of pupils of low abilities. Approximately 220 other schools reported that pupils were advised as to the type of curriculum they should pursue, but that they were not prohibited from pursuing a special curriculum because of low-grade ability.

¹³ "Five Unifying Factors in American Education," *Ninth Yearbook of the National Education Association*, Department of Superintendence, 1931, p. 90.

The problem of transfer. The extent to which transfer can be attributed to any one or a combination of these factors is not known. We do have an abundance of evidence, however, that the amount of transfer differs with

TABLE XXIII

NUMBER AND TYPES OF CURRICULA REPORTED BY EACH CLASS OF HIGH SCHOOLS

<i>Types of Curricula Provided</i>	<i>Classes of Schools, Based on Enrollment</i>						<i>Totals</i>
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	
	<i>100 or Less</i>	<i>101- 200</i>	<i>201- 300</i>	<i>301- 500</i>	<i>501- 1000</i>	<i>1001 or More</i>	
General	24	127	141	167	172	129	760
College preparatory	23	110	137	174	183	138	765
Commercial	12	89	121	153	191	129	695
Manual arts	4	25	52	79	119	68	347
Vocational	3	22	44	67	92	48	276
Teacher-training ..	2	13	31	46	38	20	150
Household arts	1	6	12	14	12	19	64
Scientific	1	5	6	8	19	11	50
Classical	0	2	1	4	11	3	21
Music	0	1	0	4	20	12	37
Technical	0	0	0	2	2	6	10
Elective	0	0	0	0	1	2	3
Total number of Curricula	70	400	545	718	860	585	3178
Number of schools.	30	135	158	185	191	139	838
Average number of curricula per school	2.33	2.96	3.45	3.88	4.50	4.21	3.79

Read the table as follows: Of the 30 Class A schools, 24 have a general curriculum, 23 a college preparatory curriculum, and so forth.

individuals, and that it also tends to vary in accordance with the amount of intelligence present. It seems that the better insight or generalizing power belongs to more intelligent individuals, and that transfer of training is definitely tied up with the ability to generalize. Thus, it

would follow that the greater the amount of intelligence, the greater the amount of transfer. We may further state that a mental set or attitude which involves a readiness to act will influence the amount of transfer. The recognition of identical elements and their application in relation to other situations are the very process of transfer. Perceptual elements in which there is recognized an identity of pattern or configuration become in their very nature a part of transferred knowledge or habit.

Do some subjects of the school curriculum have more value in training pupils to think, reason, and comprehend materials? Probably the most extensive experiments conducted that bear directly on this problem are those of the classical investigation made by Thorndike¹⁴ and others. In his first study (1922-23) Thorndike used 8,564 high-school pupils, while in the second study (1925-26) he used 5,000 high-school pupils. For his initial and final tests, he used different forms of the *I. E. R. Tests of Selective and Relational Thinking*. Of course, the final test scores were higher than the initial test scores; but the extent to which this fact might be attributed to the study of special subject matter was the problem with which he was concerned. By first equating the pupils in initial attainments and then comparing the gains made by the groups taking different combinations of subjects, he was able to arrive at some fairly objective facts of the transfer effects of a given subject of study.

The results of the two studies in terms of gains made over a pupil of the same sex and the same ability in the

¹⁴Thorndike, E. L., "Mental Discipline in High School Studies," *Journal of Educational Psychology*, 1924, Vol. 15, pp. 1-12 and 83-89; Broyler, Thorndike, and Woodyard, "A Second Study of Mental Discipline in High School Studies," *Journal of Educational Psychology*, 1927, Vol. 18, pp. 377-404.

initial test who took an average subject (business, drawing, English, history, music, shop, or Spanish) or nothing in place of it, are presented in Table XXIV. According to these data, the claims of mathematics are seemingly

TABLE XXIV

SUMMARY OF DIFFERENCES IN GAINS OF PUPILS TAKING A GIVEN SUBJECT AND PUPILS TAKING I OR NOTHING IN PLACE OF IT: DATA OF 1922-1923 AND 1925-1926. (*After Broyler, Thorndike, and Woodyard.*)

		<i>Obtained Differences in Gains in Comparison with I or Nothing</i>			<i>Estimated Differences in Gains in Comparison with I or Nothing, for Persons of the Same Sex and Ability</i>		
		<i>1922-1923</i>	<i>1925-1926</i>	<i>Average</i>	<i>1922-1923</i>	<i>1925-1926</i>	<i>Average</i>
II.	Civics, etc.....	.50	4.33	2.42	.27	5.50	2.89
III.	Biology, etc.....	-.85	.46	-.20	-.90	.60	-.15
IV.	Arithmetic, etc....	2.73	1.84	2.29	2.92	2.28	2.60
V.	Algebra, geometry, etc.....	3.10	3.93	3.52	2.33	3.64	2.99
VII.	Latin, French....	2.21	1.04	1.63	1.64	-.07	.79
VIII.	Cooking, etc.....	-1.51	-.09	-.80	-.47	.19	.14
IX.	Physics, etc.....	3.48	3.15	3.32	2.64	2.77	2.71
D.	Dramatic art....	-1.23	.46	-.39	-.29	-.67	.48
M.	Manual training..	-.35	.94	.30	—	—	—
T.	Physical training.	.24	-.06	.09	.66	1.00	.83
X.	Physiography....	—	2.83	—	—	3.38	—

sustained, while Latin and modern language sink in value. However, when we consider methods of teaching and the intelligence of the pupils, we find that a consideration of curriculum materials alone is far from sufficient. Thorndike says of this in connection with these studies:

The expectation of any large difference in general improvement of the mind from one study rather than another seems doomed to disappointment. The chief reason why good thinkers seem superficially to have been made such by having taken certain school studies, is that good thinkers

have taken such studies, becoming better by the inherent tendency of the good to gain more than the poor from any study. When the good thinkers studied Greek and Latin, these studies seemed to make good thinking. Now that the good thinkers study Physics and Trigonometry, these seem to make good thinkers. If the abler pupils should all study Physical Education and Dramatic Art, these subjects would seem to make good thinkers. These were, indeed, a large function of the program of studies for the best thinkers the world has produced, the Athenian Greeks. After positive correlation of gain with initial ability is allowed for, the balance in favour of any study is certainly not large. Disciplinary values may be real and deserve weight in the curriculum, but the weights should be reasonable.

In an experiment on memorizing conducted by Woodrow,¹⁵ the central problem related to the effect of instructed practice as compared with uninstructed practice on memory transfer. This experiment dealt with the possibility of teaching a general technique for memorizing that will aid in memorizing any activity. The control group was given no practice or training, but was tested in six different forms of memorizing at the beginning and at the end of four weeks and five days. Two other groups were given the same tests, but had either practice or training before the end-tests. The final and initial forms of each end-test were similar. The tests were given to the subjects in groups, each group containing from thirty to forty-five sophomores in experimental psychology. The rules taught to the training group were:

1. Learning by wholes.
2. The use of active self-testing.
3. The use of rhythm and grouping.
4. Attention to meaning.

¹⁵ Woodrow, Herbert, "The Effect of Type Training Upon Transference," *Journal of Educational Psychology*, 1927, Vol. 18, pp. 159-172.

5. Mental alertness and concentration.
6. Confidence in ability to memorize.
7. The use of secondary association.

In most of the end-tests, the improvement differences between the control and practice groups were small and unreliable. The training group showed a decided gain in improvement. That was true in spite of the fact that there was not much difference in initial scores. The percentage of gain in the end-tests averaged 31.6 higher for the training group than for the practice group. This shows that one kind of training may have negligible transfer value while another kind of training, with the same material, has great transfer value.

Some guiding principles in the organization of materials. In evaluating the various procedures suggested for organizing the educational materials, one should consider carefully (1) the aims of education, (2) the nature of the child (the learner), (3) the principles of learning, and (4) the principles of transfer. Some of these problems have already been discussed in connection with the various phases of the secondary-school pupil's development presented in Part I. The importance of motivation and readiness for learning is recognized by every alert teacher. The problem of the organization of materials is one that is of especial importance in relation to economy and efficiency in learning as well as to increasing retention and transfer of the materials learned.

a. *Distribution of effort.* One of the most important problems relating to learning and retention is that of concentrated versus distributed practice. This problem involves the question of drills and reviews, and thus becomes important in the organization of the curriculum materials.

The major trend of findings in the experimental work that has been carried on in relation to the problem of effort is that, if the effort is distributed, especially in the initial stages of learning, much better results will be obtained. The advantage of the distribution of effort is quite apparent in the case of retention. However, there is an optimum distribution, and if distribution is carried to an extreme, the results will be adverse in nature.

b. *The whole versus the part method of learning.* Experiments have shown that there are advantages and disadvantages in the whole and part methods of learning. An advantage of using the part method is evidenced in the learning of nonsense material. Learning a large number of unrelated ideas bit by bit is superior to learning them by the whole because one is not able to learn or retain many such ideas at a time. The advantage in using the whole method is found in learning meaningful materials.

Two problems related to that of the whole versus the part method of learning have been widely investigated and discussed. These are: (1) Will it be more economical in learning a selection to repeat the entire selection at each trial, or should the selection be broken up into parts and the parts learned separately? (2) What will be the relative merits of the two methods in the retention of the material? Results from the investigation of these problems, beginning with Steffens's work in 1900,¹⁸ seem to indicate in general that the whole method is more economical than the part method both in learning and in retention. However, many exceptions have been found by those who favor the part method. In the study of some of the experiments bearing upon the problem, one may

¹⁸ Steffens, L., "Experimentelle Beiträge Zur Lehre Vom Ökonomischen Lernen," *Zeitschrift für Psychologie*, 1900, Vol. 22, pp. 321-383.

note that the method that proves most advantageous probably varies according to certain factors influencing the experiments.

Steffens's work was carried out with poetry and nonsense syllables. In using poetry as the material to be learned, he found by experimentation that nine per cent more time was required in learning a few lines at a time than was required in learning by the whole method. With nonsense syllables, the part method was superior for the first ten days, but the reverse was true during the last 24. One will likely learn and retain a meaningful selection of prose or poetry better by means of the whole method; but one's attentive span is limited, and a long selection may be of such a nature that one cannot grasp it as a general thought pattern. This limited span of attention often causes confusion, especially in the case of individuals below the average in mental ability. It appears, therefore, that the method which is superior will vary with the character of the stimulus materials, with the organization of the materials, and with the maturity, training, and mental ability of the individual.

Directly related to the problem of the whole versus the part concept of learning is that of the organization of the materials of the curriculum. In discussing this problem as it relates to science, Downing says:

The *curriculum* needs to be unified. At present we have a series of unrelated fragments of science in the curriculum—nature study or elementary science, general science, biology, physics, chemistry. They are largely uncorrelated and the series has little if any dependent continuity. We need a curriculum that will definitely prescribe the outcomes to be achieved at each grade level—the habits to be established, the skills to be acquired, the ideals, tastes and attitudes to be achieved, the principles to be mastered.

The curriculum should be stated in terms of the things to be accomplished and not in terms of the subject matter to be studied. The latter may be suggested but the prime emphasis needs to be placed on the outcomes to be achieved. Many a teacher of science is now busy cramming the heads of pupils with the subject matter in the textbook—with no clear idea as to what educational ends are to be accomplished thereby—without, in many cases, achieving any that are really of value.¹⁷

c. *Student activity and difficulties.* A criticism sometimes given of the present-day school procedure is that the teacher does too much of the organization work. If the teacher finds the problems, arrives at techniques for their solution, and evaluates the various procedures and outcomes, the pupils become passive products. Learning is never a passive process but takes place as a result of attentive activity directed and organized in relation to problem situations. The high-school teacher should avoid the pitfalls of over-explaining the materials of the subject. Explanation, without limit or cessation, of every problem or difficulty that arises robs the pupil of the opportunity for organizing the problem materials.

It has oftentimes been asserted that learning takes place more readily through one sense organ than through others. Some individuals have been described as "ear-minded" and others as "eye-minded." So far as experiments have been conducted on this problem, however, the various neural connections of the cortex aroused through one sense organ are just as modifiable and retentive as are the associating centers stimulated through others. Other things being equal, it would be logical to assume that one learns quite as readily through one sensory avenue as

¹⁷ Downing, Elliot R., "Improved Science Teaching," *School Science and Mathematics*, 1934, Vol. 34, p. 589.

through another. There would be an exception, however, for those individuals whose receiving, connecting, or central mechanisms are defective. Likewise, habitual behavior would likely build up habits that might affect one to a certain degree. The types of materials and manner of presentation, as well as other conditions, may, consequently, determine which avenue of presentation is preferable for a particular individual.

The schedule. Various investigators have conducted experiments among school children in order to ascertain the time of day when the capacity for work is the greatest and the time when it is the least. The results indicate in the main that scores in the late morning are highest, and that there is another peak in the mid-afternoon. Heck attributes the decline after a long period of work to certain psychological or environmental factors that are not constant, such as boredom and ventilation. Gates points out that the differences are, after all, not very great and may well be attributed to factors other than fatigue. These experiments, like those referred to in connection with teaching load, present no control over the expenditure of energy by the teacher or pupil. Perhaps the teacher does not get warmed up to maximum efficiency until a later period of the day, and probably she too becomes bored, owing to prolonged effort or distracting factors. It is quite likely that, if the schedule of the school for starting and closing were considerably altered, the course of efficiency for the day's work would be very different. Ventilation, boredom, distraction, hunger, overeating, and loss of sleep, rather than the sun, are factors that in all probability account principally for the diurnal course of efficiency.

Summary. Today the secondary-school curriculum is

going through a process of transition. The evolution of the school curriculum follows rather than precedes the needs of society. During the past century, many changes have been produced in our social order. Our curriculum changes picture the changes that have been going on outside the school. A changing philosophy is present in our education which is changing our curriculum in the direction of making the pupil rather than subject matter the center of education. The recent biological developments in which the individual is conceived of as a unit are having their influence in the revamping of the organization and procedures connected with curriculum materials.

Recent experimental studies of the various problems of learning have given a renewed emphasis and in many cases a redirection to the development of the secondary-school curriculum. The relational concept that has been emphasized in the transfer of training studies and the importance of meaning and association revealed through various learning experiments have redirected our curriculum trends and guided us in the organization of the subject matter.

Thought Problems

1. Differentiate the concept of curriculum organization in terms of subject matter from that of curriculum organization in terms of the pupil.
2. Evaluate the principles presented relative to the organization of subject matter. What other principles would you suggest?
3. Show by illustration the meaning of the thought presented concerning the organization of materials in terms of the pupil.
4. How may individual differences be taken care of in the curriculum? Of what importance is this problem?
5. How is the curriculum related to the aims of education? Illustrate your answer.

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CHAPTER X

Psychology of Language—Reading

What is language? It is an interesting fact that the average person rarely meditates on the origin and development of language, although he uses it constantly. The mechanics of oral and written expression in language has been emphasized, but the fact that language is an important social institution, probably our most important one, and was developed as man developed and is still a growing, changing thing, has been overlooked. When we consider the close relation existing between thought and language and the fact that social development and co-operation would be well-nigh impossible without language, we recognize more fully its nature and significance.

What, then, is language, and what part does it play in the life of the race? In order that the student may realize the different ways in which the subject is approached, some quotations have been selected from the writings of philologists, psychologists, and anthropologists.

The essence of language is human activity—activity on the part of one individual to make himself understood by another, and activity on the part of the other to understand what was in the mind of the first. These two individuals, the producer and the recipient of language, or as we may more conveniently call them, the speaker and the hearer, and their relations to one another, should never be lost sight of if we want to understand the nature of language.¹

¹ Jespersen, Otto, *The Philosophy of Grammar*, New York, Henry Holt and Company, Inc., 1924, p. 2.

Language, like the tool, is primarily an instrument to be used for the accomplishment of objective ends. It provides an indirect way of dealing with things. It has, accordingly, a cognitive status comparable to that of the tool. Moreover, language, like the tool, and unlike the limb, is something objective to, and independent of, the individual who uses it. It is a factor which he finds in his psychological environment, and to which he must adapt himself. It has a structure of its own, which he must learn to take account of in his use of it.²

Language is a purely human and non-instinctive method of communicating ideas, emotions, and desires by means of a system of voluntarily produced symbols.³

We may begin with the statement that language is a means or instrument for the communication of thought, including ideas and emotions. Thus at the very outset we mark off thought and language as different processes, though they may be very intimately related, are to a large degree interdependent, and are in part identical in a certain sense.⁴

These citations indicate that authorities do not agree as to the exact function of language in the life and development of the individual. They do, however, point out that language is a medium for communication. The importance of language in social development is also indicated. Our language we determine in a large measure by educational practice relating to language activities. At the present time educational practice, so far as English teaching is concerned, is a result of tradition and has been little influenced by modern movements in psychology and biology. When teachers of the classical languages realized that Latin and Greek might have functional value in the development of the pupil and began to modify their teach-

² De Laguna, Grace Andrus, *Speech; Its Functions and Development*, New Haven, Yale University Press, 1927, pp. 244-245.

³ Sapir, Edward, *Language; An Introduction to the Study of Speech*, New York, Harcourt, Brace and Company, Inc., 1921, p. 1.

⁴ Pillsbury, W. B., and Meader, C. L., *The Psychology of Language*, New York, D. Appleton-Century Company, Inc., 1928, p. 4.

ing accordingly, English teachers claimed to be the guardians of "culture." Language, especially English, is treated by many teachers as an external, objective thing which must be cut and fitted to the individual pretty much as a tailor cuts and fits a garment.

What, again, is language? Probably a better notion of what language is may be secured by first considering what it is not. Language is not an instinctive mode of behavior which has been given to man in some mysterious manner through his biological heredity and by which he acquires meanings through the acquisition of words. It is not enough to say that the function of language is expression, nor is it sufficient to hold that its function is to convey ideas or thoughts. Either function or both may be performed. This, however, does not give the deeper significance of language in the life of the individual or the group.

A thorough discussion of the subject would involve a study of the biopsychological foundations of behavior and of the organization of the individual. A brief statement about language based on such a background must suffice here. Language, it seems, must be considered first of all as a method of making responses or adjustments. Only in a secondary sense may it be regarded as a stimulus. Its primary function is that of aiding the individual to respond or to adapt himself to his surroundings.

Language is more than words and word combinations. It is even more than sentence and paragraph structure. It is essentially a problem of how to respond to situations created by others and of how to present situations which will secure and hold the attention of and obtain a favorable response from others. In short, language is a problem of behavior, and it should be regarded, not as a method which is to be mastered for its own sake, but as a method by

means of which the individual is better able to adjust himself by co-operating with and securing the co-operation of others.

Language and psychology. The problem of language both in its origin and in its development in the individual is essentially a psychological one. This fact has been overlooked by all language students save a small number. One may, because of early training, have attained almost perfect control over the mechanics of his own vernacular, and may, indeed, have learned other languages, without even knowing that language is essentially a product of man's own mental development.

Language study may be approached from either the mechanical or the psychological point of view. The mechanical approach looks at language as an objectively fixed thing and assumes that the chief function of language teaching is the development of language responses which conform to certain set standards. A good deal of the time spent in teaching language has this as its purpose. Rarely is the thought of a theme commented upon. The teacher is too busy checking errors of spelling, punctuation, capitalization, sentence structure, and the like, to be concerned with what the pupil is trying to say. There is little wonder that oral and written expression are disliked by most students and that pupils go on year after year, as they progress through school, repeating the same errors.

If one desires to contrast language as an objective tool which the child must learn to use in a concise and definite way with language as a form of behavior to be developed through the need for adjustment, let him undertake the study of such problems as: the situations which call for language responses in the young child, the function of language in an infant's behavior, the growth of language

ability in the primary- and elementary-school child, environmental influences on speech, the methods of teaching language, the ways in which literature has molded the traditions and thoughts of a nation, how language *barriers* have caused suspicion and distrust, and how an absence of language barriers has contributed to co-operation and the diffusion of culture. In fact, the study of any problem connected with the origin and growth of language either in the individual or in the race reveals a striking contrast in point of view with topics typical of those usually treated in texts on teaching English in the junior and senior high school.

A. Origin and Function of Language

Some earlier concepts. The problem of the origin of speech appears, on first thought, to be of minor importance. However, it becomes more important to us when we consider the fact that our notion of its origin determines in a large measure our view with respect to its function in the life of the child, and, accordingly, to our educational philosophy and methods. The problem of the origin of language is declared by Vendreys⁵ not to be of a linguistic order. The truth seems to be that speech and language in general are closely connected with mental development and, indeed, that they present psychological problems. Only in a certain sense can we speak of the origin of language at all, because it is not an external thing whose structure and content have been fixed.

There are a number of older conceptions of the origin of language, and many of these have left their influence

⁵ Vendryes, J., *Language: A Linguistic Introduction to History*, New York, Alfred A. Knopf, Inc., 1925, p. 5.

on educational procedure. One of the older conceptions held that language was given to man in some miraculous manner. Another of the older theories closely related to the former was based on the supposition that language was artificially created by man. Both these theories have left traces in a certain school of thought which holds that language is something independent of any necessity for obeying its own laws. This school of thought in educational practice tends to deify language as it is and has its face turned toward the past rather than the future.

Other theories mainly supported by writers⁶ of the latter part of the nineteenth century held that language arose because men had many ideas and needed a way to express them. Several of these theories are well-known. The so-called "bow-wow," "ding-dong," and "pooh-pooh" theories are the most common ones. Still other theories held that man had a faculty for giving expression to the ideas and concepts with which his mind was filled. These theories are based on a notion that man had reached a high state of mental development before he developed language, and, of course, explain nothing, because the chief problem of language has to do with the development of meanings, which are always attached to symbols of some sort.

Unity in development. The implication that language development and mental development really refer to but different aspects of the same thing has already been made. We need not elaborate on this point at length. The development of men occurred as members of the race attempted to adjust themselves to an ever changing world. This

⁶ Muller, Max, *The Science of Language*, New York, Longmans, Green and Company, 1885; Whitney, W. D., *Language and the Study of Language*, New York, Charles Scribner's Sons, 1867.

is but another way of saying that those individuals better able to adjust themselves tended to survive through their offspring, while those who were less able did not. As Beer⁷ says: "*It is because man is homo faber, but even more so because he is homo loquens, that he is Homo Sapiens.*"

Man developed because he was able to develop a superior mechanism for adaptation. The hand and the brain are not to be viewed as separate developments which took place independently and were later co-ordinated. Man is a biopsychological organism and his unity both in development and in action is his chief characteristic.

Early sign language. Picture writing in the general form of reproductions of the object or situation is usually regarded as the earliest form of written language, and probably developed at one stage to a larger degree than sound language. Although gesture is usually regarded as the oldest means of communication, the earliest forms of language, whether gestures, pictures, or sounds, were directly related to the object or situation being referred to. The picture of the object was, thus, similar to the object and called it forth in the mind of the subject communicated with. The sound of the object was a reproduction of some sound pertaining to it and called forth the object because of this direct relationship to it. The gesture was a reproduction of the appearance, movement, or the like, of the object and called forth the association thus related.

By the combination of pictures, a larger unit of thought or feeling was introduced. By the combination of sounds, a still larger unit of thought or feeling was introduced. The sounds and the pictures were wholly unrelated to each

⁷ Beer, Henri, "Foreword," Vendryes, *Language*, New York, Alfred A. Knopf, Inc., 1925, p. xviii.

other, but each was directly related to specific objects or situations. Since a particular picture was related to some specific object and a specific sound was related to the same object, it was only natural that in time the two would be associated together in the consideration of the object. Thus, through a process of continued association, meanings grew and forms and sounds became related. In the fusing of the forms and sounds we see the beginning of meanings, rather than images, growing out of the sounds and forms. It was with the fusion of these that language began to be more and more symbolic rather than reproductive.

This fusion resulted in the development of the early Semitic signs which were destined in time to become further divorced from the objects and situations and to be wholly alphabetized. Out of these early Semitic signs, which were fusions of sounds and pictures, we have the development of the Greek and Latin alphabets. From these languages have finally emerged all the modern alphabetic systems of Western civilization, and this has exerted and is exerting even today a powerful influence in the molding anew of the Asiatic systems. Since these sounds and written symbols were not passed to us according to the sounding of the particular letters making up the words, we have a rather unphonetic alphabet. Alphabetic systems of writing are conventional signs unconsciously handed down with our social heritage.

An excellent illustration of the extent that the symbol for a specific object was simplified and thus finally evolved as a form almost wholly different from the object which it originally represented is the symbol for *sun*. This is presented in Figure 12 along with the symbols for *moon*, *mountain*, *tree*, and *dog*. Form writing, thus, gradually

developed into a more convenient type of writing. This could not have been possible if certain similarities had not earlier been retained in order that the association processes would function in presenting the meaningful situation. The picture of the basket, even used sometimes today to signify plenty, can well be traced to early symbols in which the basket was heaped with things to eat. "The development of language may be described as proceeding from the elaborate representation whose meaning is obvious to the

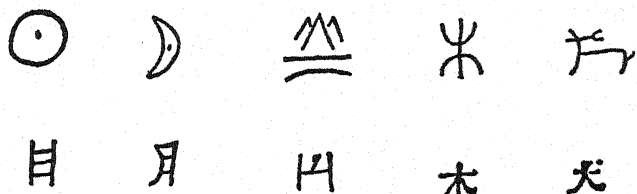


Fig. 12.—Ancient and Modern Chinese Symbols for *sun*, *moon*, *mountain*, *tree* (or *wood*), and *dog*. (Upper row, ancient symbols; lower row, modern symbols.) (From Judd, C. H., "The Psychology of Social Institutions," New York, The Macmillan Company, 1927, p. 163.)

conventionalized sign whose meaning is known only by the informed. The original relation between sign and meaning was fairly close, natural, and direct; later relation became more and more remote, artificial and indirect."⁸

Language and thinking. Concerning thought, Carlyle said:

How noiseless is thought! No rolling of drums, no tramp of squadrons or immeasurable tumult of baggage-wagons, attends its movements: in what obscure and sequestered places may the head be meditating, which is one day to be crowned with more than imperial authority; for Kings and Emperors will be among its ministering servants, it will rule

⁸ From *The Psychology of the Elementary School*, copyright 1931, by permission of the author, Harry Grove Wheat, and the publisher, Silver Burdett Company. Page 54.

not over, but *in*, all heads, and with these its solitary combination of ideals, as with magic formulas, bend the world to its will!

The thinking process itself shows as wide a difference from person to person as do the responses of a young child at different stages of maturity. As we study the conditions under which thought takes place, and the relation of thought to speech, we notice that the growth of the ability to think is conditioned by many variables. In the first place, language itself should be considered as a function of native ability and social environment. Holding native ability constant, we note the importance of social environment in the development of correct language habits and good habits of thinking. Again, with social environment constant, we may note the importance of native ability in the development of language and thinking.

The relation between thought and language is a problem somewhat broader than the problem of speech and thought. Various authorities have approached the problem in different ways. Wundt held that the idea was present in the mind before an attempt was made to express it through speech. This, of course, creates a dualism between thought and action which is untenable in the light of modern biological findings.

It might be just as well to state some of the fundamental problems of language and thought at once. Such problems are: (1) Is speech thought? (2) Is there thought without words? (3) What effect does language development have on ability to think? There are numerous other problems connected with speech and thought, but the ones named here are the most fundamental.

It is a well-known fact that every excitation tends to pass over into some form of expression. Every movement

arises from some stimulation; every stimulation tends to give rise to some movement. It is sufficient to state here that movements, meanings, ideas, and sounds may be different aspects of the same reaction to a situation. In the case of a person thinking silently or trying to get the thought in reading or listening to a lecture, there is a great deal to be said for the theory which holds that along with the sensory perception go the same muscular movements which would be made if the person were speaking aloud what he is thinking, reading, or hearing. Vendreys seems to get pretty close to modern psychology when he says:

It is quite true that we do not express by sounds all the images present in mind. Thinking, for example, does not require the exercise of the sound organs; but thinking is really an inner language in which the sentences are linked together just as in articulate speech. And each of the sentences formed in thought contains, in full force, all the articulations of speech. Thought progresses along the lines of sound, even when no sound is expressed. At times, indeed, we unconsciously give vent to our thoughts in their corresponding words.⁹

There are a number of problems connected with the question relating to language ability and thinking ability. We have stated that, in the first place, language is a function of native ability and social environment, and that, holding native ability constant, we find that social environment is an important factor in language development. Undoubtedly, the forms and content of thought are one aspect of the individual's ability to react. This ability is expressed in another manner also, namely, the mechanisms of language.

Social environment and speech. Psychologically, language arose because of individual needs, but it has become

⁹ Vendreys, J., *op. cit.*, p. 641.

man's important and most prized social institution. Without written and spoken language, the development of a highly integrated and co-ordinated social life would be impossible.

The influence of language in helping to create a psychological environment is clearly seen in catch phrases used in time of war, political campaigns, and the like. Civilized man is not unlike primitive man in this respect. He has certain stock epithets and phrases about which he can crystallize his emotions, points of view, and prejudices.

Another point relates to the influence of the psychological environment on our speech. It is interesting to note the fact that our speech is conditioned by the person whom we are engaging in conversation. To some of our friends, we talk shop; to others, bridge; to others, golf; and to some, nothing. It is further interesting to note that in an animated conversation the participants never stop to think what they are going to say next (to organize their speech). One person makes a statement, and this is the stimulus which arouses a counter statement in another. The conversation may run on at great length with little or no effort at conscious organization. The whole performance may be pretty much on the same level as when several persons are "pitching and catching ball": one act succeeds another purely on the habitual level. So it is with much of our speech: we simply respond to situations by making conversation of the habitual level. It is only when we are attempting to see what we can do with words that we are conscious of speech as such.

Language and the individual. Everyone knows that individuals vary widely in their ability to use language. Two individuals of the same age, mentality, sex, and social

development would never show exactly the same language characteristics. While such individuals would vary in the particular elements of language ability, yet, when compared to a norm, they would likely possess about equal ability. According to Jespersen, "The more commonplace a person is, the more will his language bear the stamp of the community in which he lives: the more unique his nature, the more peculiarly his own will be the colouring of his language."¹⁰ Civilization fosters individual development while primitive people are completely dependent on fixed ways of behaving.

Individuals develop in connection with speech attitudes which very materially affect language development. Some persons develop an attitude which leads to using the simplest language which will adequately serve the situation, while others possess an attitude which leads to attempting the use of a complex language. These two attitudes undoubtedly lead to great differences, not only in potential language ability, but in ways of thinking as well.

A distinction may be made between potential linguistic ability and actual ability as expressed in usage. All linguistic experiences are potent in the development of ability from the functional point of view. "Potential linguistic ability" as used here refers to a sort of latent ability. There is a great variation between achieved usage in expression and potential usage as revealed by a free association study. It seems reasonable to suppose that individual attitudes toward the usage of language play a large part in determining this difference.

¹⁰ Jespersen, Otto, *Mankind, Nation and Individual from a Linguistic Point of View*, Cambridge, Mass., Harvard University Press, 1925, p. 204.

B. Reading Activities

The nature of reading. To the question, "What is meant by the ability to read?" the average student would respond, "It is the ability to get meaning from the printed page." The answer just given is in a way correct, but it does not indicate the deeper significance of the ability to read. To say that reading is bringing meaning to the printed page would be nearer the truth. The printed symbols on the page serve as stimuli to which the individual is able to react in terms of the meanings previously derived from experience. Since the words and other language units may be arranged in new combinations, the reader may secure new meanings from the context.

Reading is more than reacting by naming words. The symbols (words) merely serve as stimuli. The images, memories, thoughts, emotions, and the like which are associated with the combinations of symbols used in language, and which are aroused by the symbols, might more appropriately be termed *reading*.

What the reader gets from the printed or written page is determined by his previous experiences. These are, of course, determined by his innate ability and his environment. During the course of the individual's life, he has associated sounds (words) with other objects and actions. Later, he has associated oral with written words, and the latter with objects and actions. Finally, when written language is presented, experiences connected with it are recalled. Thus, we may say that the individual brings experiences to the printed symbols. These symbols serve as stimuli arousing reactions in terms of old experiences.

Relation of reading to the other subjects in the high school. It is important that the relation between reading

ability and ability in the other subjects studied in the high school be known. Only through a study of the factors influencing high-school attainments will the teacher know how to plan her work. It is frequently stated that pupils fail in high school because they are unable to read.

Miles¹¹ used the *Thorndike-McCall Reading Scale* and the *Haggerty Reading Examination* to measure reading ability in the high school. Scores secured from these tests were then correlated with achievement in each of these five fields: (1) English, (2) mathematics, (3) foreign languages, (4) history, and (5) science. Achievement in each of the five subjects just mentioned was measured in terms of examination grades over a period of four years. *The National Intelligence Test* and the *Miller Mental Ability Test* were also used. Thus, it was possible to compare both reading ability and mental ability with achievement in the five fields. The relationships are exhibited in Table XXV.

TABLE XXV

RELATIONSHIP AMONG READING ABILITY, MENTAL ABILITY, AND CERTAIN OTHER SCHOOL ABILITIES. (After Miles.)

Subject	Intelligence		Reading	
	National	Miller	T.-McC.	Haggerty
English.....	.50	.37	.59	.67
Mathematics.....	.49	.31	.16	.40
Language.....	.31	.27	.09	.19
History.....	.40	.26	.17	.18
Science.....	.49	.25	.006	.28

An analysis of the data exhibited in the table reveals that rather low correlations were found between both the reading and intelligence tests and achievement in the

¹¹ Miles, D. H., in *Contributions to Education*, Vol. II, Chap. XVII. Copyright 1928 by World Book Company, Yonkers-on-Hudson, N. Y.

school subjects. However, standardized tests were not used in measuring achievement in the school subjects, and, in view of the known unreliability of school marks, we should expect to find a low degree of relationship, which is found in most of the studies. Using the standardized tests named in the table for the purpose of measuring achievement and intelligence, one of the writers secured the correlations presented in Table XXVI. It is interesting to note that there is a high correlation between the ability to read and achievement in certain of the subjects and a low correlation in the case of other subjects.

TABLE XXVI

SHOWING CORRELATIONS BETWEEN READING AND CERTAIN STANDARDIZED TEST SCORES. (*N* varies from 71 to 97.)

	Reading		Terman
	Thorndike- McCall	Whipple	Mental Ability
<i>Illinois Algebra</i>.....	.54	.58	.69
<i>Cross English</i>.....	.61	.60	.57
<i>Van Wagenen Am. History</i>.....	.64	.67	.64
<i>Hill Civics</i>.....	.59	.63	.52
<i>Ruch-Popenoe Gen. Sci.</i>.....	.36	.39	.50
<i>Wilkins Modern Lang.</i>.....	.21	.20	.61
<i>New York Latin</i>.....	.27	.24	.73
<i>T.-McCall Reading</i>	—	.53	.46
<i>Whipple Reading</i>.....	.67	—	.53

Relation of achievement in reading to mental ability. Another problem closely related to the one discussed in the preceding paragraphs is that of the relation between achievement in reading and mental ability. In a fairly recent investigation, it was found that the correlation between reading and the other school subjects becomes progressively smaller as pupils advance through the grades.¹² The same is true for correlations between intelligence and

¹² Garrison, S. C., unpublished materials, Nashville, Tenn., George Peabody College, Jesup Psychology Laboratory.

reading. The relation between mental ability and certain of the school subjects as measured by standardized tests is given in Table XXVI. An inspection of the correlations given there shows that fairly high correlations exist. The *Terman Test of Mental Ability* seems, as a rule, to be a better measure of what pupils will do in school than the reading tests. The reading test scores correlate moderately highly with mental ability.

There are several possible explanations of the fact that reading test scores correlate lower with scores from other achievement tests and intelligence tests in the high school than they do in the grades. In the first place, few high-school tests are as well standardized as are most of the tests used in the elementary grades. In the second place, the content of the subjects in the high school is not as well agreed upon as is that in the lower grades. The skills to be developed and knowledges to be acquired in the lower grades are fairly definitely fixed, while in the high school teachers have a greater latitude in their choice of subject matter. Thirdly, as a rule, variation in mental ability among the pupils of the grades decreases from the first to the twelfth grade. This is due to the selective character of the school: pupils of low ability become retarded and eventually drop out of school, so that the range of abilities tends to be narrowed and the test scores tend to be skewed toward the upper range, and the size of the correlation, thus, is reduced.

Reading and study in the high school. Reading in the high school has been criticized because when reading ability is put to practical use in the subjects of the junior and senior high school, the results are not what should be desired. Many pupils appear unable to do the work of the school because they do not have sufficient reading

skill to get the content of what they read. Consequently, as we go higher in the grades, we find larger numbers of pupils failing. Lack of intelligence undoubtedly plays a part in failure in high school, yet fewer pupils fail in reading as they advance in the grades.

In the study of Jacobson,¹³ conducted with ninth-grade general science pupils as subjects, it was found that improvement from special reading instruction spreads to other subjects. The poor reader profited most from such instruction. The study by Wagner¹⁴ indicates that good results may be obtained from specific training of an individualistic nature in reading.

Judd and Buswell¹⁵ in their studies of reading found that pupils were able to read the materials of instruction used in the reading work but were unable to grasp the content in certain other subjects. These studies emphasize the importance of early training in reading with various kinds of content.

If training in reading has as one of its objectives the development of the ability to get information from the printed page, then pupils should be introduced early to the type of material they will read later. There should be specific training in reading in each of the various fields. It is to be questioned whether training in reading a highly imaginative and fanciful type of material is of great benefit to the student when he begins to read the material of the subjects requiring accurate, intelligent expression

¹³ Jacobson, P. B., "The Effect of Work-Type Reading Instruction Given in the Ninth Grade," *School Review*, 1932, Vol. 40, pp. 273-281.

¹⁴ Wagner, Mazie Earle, "Improving Reading Ability of High School Juniors," *School and Society*, 1932, Vol. 36, pp. 767-768.

¹⁵ Judd, C. H., and Buswell, G. T., "Silent Reading: A Study of the Various Types," *Supplementary Educational Monographs*, 1922, No. 23.

rather than an emotional, imaginative type of expression.

The function of reading in the higher grades is primarily extending experiences. Through language, then, pupils are able to extend their experiences much further than would otherwise be possible. The individual is not limited by time or space. The only limitations to the breadth and depth of his experiences are imposed by (1) his maturity, (2) his native ability, (3) his training, (4) how well he is motivated, and (5) the information available. By the time the pupil has reached the high school, his development in reading should be such that he can go right on with his schoolwork without serious difficulty.

While it is true that the training received in connection with the reading material of the elementary school is often inadequate for the work of the high school, yet the teachers of the high-school subjects are often not interested in the language problem and have little conception of the function which language plays in the life of the child. The science teacher, for instance, views his problem as one of helping pupils to secure so much information during the course. The emphasis must, according to his point of view, be placed on the acquisition of many new words and symbols which have meaning only in connection with the sciences. Also, old words take on new meanings. From the language point of view, the learning of a new subject is, really, acquiring symbols which may be used to stand for certain things, processes, or relationships in thinking. It is just as important for the teacher of science to know the relation of language to thought as it is for the language teacher.

Many of the reading problems of high-school students

are really study problems. Yoakam gives the following situations as examples of school activities involving reading and study:

1. When the ideas of selection are being examined to determine whether they are of use in solving a problem.

2. When words are being studied in order to know what their particular meaning is in a particular setting.

3. When phrases and sentences are being examined to see what their relation to the context may be.

4. When directions are being followed, as in doing an experiment in chemistry, drawing a figure in geometry, or making a model in manual training.

5. When an article is being read for the purpose of evaluating it rather than for merely committing the expressed ideas or words to memory.

6. When titles, paragraph headings, and other divisional headings are being evaluated as to their appropriateness in the light of material presented to support them.

7. When the object is to experience an emotional reaction from a poem or prose selection rather than to memorize its content.

8. When comparisons are being made between the accounts of different writers of the same event or of the same fact.

9. When narratives are being read for the purpose of enjoyment. (Comprehension of the essentials of the plot is a necessary condition of the enjoyment.)

10. When literature is being read for the purpose of appreciating beauties of diction and use of figurative forms.

11. When mathematical problems are to be solved.

12. When outlining, summarizing, or other forms of organization are required.

13. When the reader is following the directions on an intelligence or achievement test, or preparing to work out stated problems in a textbook or outline.

14. Wherever pure memorization is not the object of study.¹⁶

¹⁶ From Yoakam, G. A., *Reading and Study*, New York, The Macmillan Company, 1928, pp. 134-135.

From Yoakam's analysis it appears that there are many situations in which comprehension in reading is the main feature in study. If pupils possess inferior reading ability, it is evident that they are unable to make desirable progress in achievement. Some of the more important specific factors entering into the development of comprehension are:

1. Vocabulary, or word meaning.
2. Recognition span.
3. Reading readiness.
4. Associations.
5. Judgments, analysis, and comparisons.
6. Organization and reproduction.
7. Speed of reading.
8. Interest and motivation.

Poor reading ability, especially slow reading, is very prevalent among high-school students as well as college students. Studies of this problem show that many students in the twelfth grade do not read as well as the average seventh-grade pupil. The chief defect in reading that is found among high-school students probably is connected with rate. Slow reading is usually caused by a narrow span of comprehension.

There are several devices which aid students in developing a wide comprehension span. Light, interesting material read under a definite drive is of great aid in developing ease and rapidity of reading. Anticipation of meaning, that is, trying to interpret the passage before it is completely read, causes one to "look forward" in reading and increases speed. The third suggestion in improving speed is concerned with motivation. Setting a

time limit or reading under pressure of time furnishes a good incentive. In a study of extensive and intensive teaching of literature, it was found that the rapid reading of a large amount of literature was just as effective for comprehension and appreciation as a more detailed analysis of a much smaller amount.¹⁷

The investigation by Eleanor Holmes¹⁸ compared the results obtained from two reading programs. One group was guided by means of questions on the materials, while no guidance was provided for the second group. There were 84 subjects in the one group and 86 in the other. These groups were equated for ability. The groups were reversed after each experiment so that the results of practice might be controlled. Selections of reading materials from both English and science were used, these selections consisting of about 2,000 words from texts commonly used. Tests were made for both immediate and delayed recall, and a check was made on answers to supplementary questions not included in the study questions. The results showed a superiority for reading and study with the guidance of questions. This was true for both immediate and delayed recall, as well as for the ability to answer supplementary questions correctly.

Reading interests and growth. There are several reasons why it is important to know the reading interests of high-school pupils. First, it is necessary to know the interests of pupils before any intelligent program for the improvement of reading is made. As with all other school

¹⁷ Coryell, Nancy G., "An Evaluation of Extensive and Intensive Teaching of Literature," *Contributions to Education*, Teachers College, Columbia University, 1927, No. 275.

¹⁸ Holmes, Eleanor, "Reading Guided by Questions versus Careful Reading and Re-reading without Questions," *The School Review*, 1931, Vol. 39, pp. 361-371.

activities, the work must be based on the present attainments of the pupils. It is foolish to attempt to teach materials for which the child has no basis in experience. To teach literature to pupils who already have an interest in good literature is a task quite different from that of teaching literature to pupils who have no interest in the subject; and the latter, again, is a task differing greatly from that of teaching good literature to pupils who are interested in the wrong kind of literature.

A knowledge of the interests of pupils is also valuable as a guide in the selection of the materials of instruction. In the main, good literature which is of interest to boys and girls of a given age should be taught at that age. A knowledge of what pupils like at various ages will help in the selection of other materials with which they are not familiar. Furthermore, if the teacher knows the type of literature in which the pupils are already interested, she knows where to put emphasis and how to motivate the reading. Not only will this information be valuable for the work in literature, but it will also be a means of better co-ordination with other fields of study.

Chapter VII was devoted to the interests and attitudes of high-school pupils. A view of the materials there presented will give further information of value in the development of the reading program for high-school boys and girls. Terman and Lima,¹⁹ in their investigation into the reading interests of children, found little sex difference in reading interests before nine years of age. However, by the age of ten, the difference is marked. Girls read more at every age than do boys. Girls do not differ as

¹⁹ Terman, L. M., and Lima, Margaret, *Children's Reading* (rev. ed.), New York, D. Appleton-Century Company, Inc., 1932. (A splendid graded list of books is presented in this volume.)

much among themselves with respect to books read as do boys. Boys read over a much wider field. Not only do boys differ among themselves, but the individual boy reads over a much wider field than does the individual girl. The girl rereads a book more often than does a boy. In the studies referred to in Chapter VII, the types of books and magazines read by boys and girls are clearly shown.

It seems imperative that teachers of literature should take cognizance not only of sex differences but also of the fact that students' interests change. While the interests of students should not be taken as an absolute guide to student reading in school, yet they point the way for motivation and guidance. Not interest but need should determine the ultimate reading demands of the school. Interest should be used as a starting point, but the meeting of the needs of the pupils must be the goal of reading.

Reading and literature. It is perhaps unfortunate for both reading and literature that they should be so closely associated in the minds of teachers. Roughly stated, the objectives of instruction in reading are the development of habits and skills, or the mechanics of reading, while the objective of instruction in literature is largely concerned with appreciation. The development of the mechanics of reading is fundamental to most of the subjects of the school and to many activities outside of school. Appreciation, on the other hand, is the cultivation of taste for the various kinds of art. Appreciation, as the school tries to cultivate it, is largely concerned with literature, although there seems to be no reason why it should not be an aim of each of the school subjects.

Literature as a term is used in two different meanings. In its broadest meaning, it includes writings in all fields.

In its narrowest meaning, it includes prose and poetry that would be classified by authorities in the English field as art. In this second sense, most writings in science, history, and so forth, would not be classified as literature except as the writing approached a work of art.

Native ability and literature. It is difficult to find a measure of relationship between ability in literature and intelligence, or between achievement in literature and achievement in the other school subjects. The chief reason for this lies in the fact that there are few, if any, reliable measures of achievement in literature. Willoughby²⁰ undertook to secure a ranking of the different subjects according to their demands upon intelligence. He had 25 judges arrange 48 school subjects according to the demands that they make upon intelligence. When the subjects were arranged from the most to the least difficult, dramatics was found to be the hardest and penmanship the easiest. The school subjects were all assigned P. E. values according to approved statistical methods. Physics received a value of 3.14 and penmanship one of 3.45. Literature received a value of 1.02. Willoughby next had 309 bright high-school students rate the school subjects on a scale of from 1 to 5 for preference and ease. Since a score of 1 was given to a subject liked "very much," a subject with a small total rank has a high preference score. From his study of the data, he concludes: "*The less intelligence a subject demands, according to competent judges, the harder it is for these pupils, and the less they like it; the more intelligence it demands, the easier it is and the better they like it.*" The significance of the statement above for the teacher of literature

²⁰ Terman, L. M., *Genetic Studies of Genius*, Palo Alto, Cal., Stanford University Press, Vol. I, Chap. XIX.

lies in the fact that 48 per cent of all these students rated literature as liked "very much," and only 1 per cent rated it as disliked "very much."

In a study of the relation between elements of English and intelligence and the ability to judge poetry, Shachtman²¹ found that, as a rule, there were only small correlations between the ability in various elements of English and the ability to judge poetry. The one element correlating most highly with this ability was comprehension of literary passages. It is significant that in this study mental ability was more closely related to ability to judge poetry than was any of the many elements of English tested.

Appreciation. The psychology of appreciation is important for the student of literature. Appreciation undoubtedly has its origin in the primitive emotions and is a result of training. Appreciation is, however, more than emotion, as emotion is generally known. It has certain intellectual aspects and is as definitely a result of one's training as is reading ability. It is subject to the same laws which control responses of thought and motor co-ordination.

In looking at a great painting, reading a masterpiece of literature, or solving a problem in geometry, the person who is properly trained responds with definite appreciative reactions. Appreciation, then, is a question of habit formation, and as such is developed according to the laws of learning. It is the business of education to modify the primitive emotional responses of pupils into a higher form of emotional response by connecting them with

²¹ Shachtman, Joseph, "Elements of English Related to the Judgment of Poetry in Grade Eleven," *Contributions to Education*, Teachers College, Columbia University, 1929, No. 373, p. 47.

events, principles, methods of work, and the like, which are most desirable. In this connection it should be stated that appreciation also involves the ability to place values properly and exercise judgment concerning events, principles, and the like. The pupil will develop appreciations of a kind and connect them with definite situations in life regardless of training. The aim of training is to see that the appreciations developed are attached to the best the race has produced in literature, art, methods of work, and so on.

When we state as one of the aims of reading and literature the development of appreciation, we must remember that training comes when we make specific responses to definite situations. Appreciation may be of many degrees. Much that passes as appreciation is really of a very low order bordering on mere effusion, for example, the statement of one student, "I adore poetry." Appreciation of literature is based on the ability to make nice choice of words and expression as well as on sentence structure. It depends, among other things, on one's ability to comprehend and interpret the materials read, and this will depend on a background of experience. Appreciation is even more than language form. It depends, as was just stated, on the student's having a wealth of experience which gives him the ability to add to the words of the author from a richness of detail in his own experience. The appreciative reader is usually able to carry the implications, references, and suggestions further than the author has carried them.

Individual differences in ability to appreciate. Children differ both with reference to what they appreciate and in regard to the extent of their ability to appreciate. In this connection, Bishop states, "The level of apprecia-

tion of children varies with their native ability, home life, reading, travel, and experience. As those factors vary, so will the emotional response vary.”²² It seems reasonable to suppose that children who have reading difficulties also have difficulties in developing appreciation. If we wish to develop appreciation, we must first determine the type of material we wish appreciated and then train for appreciation in that type. The pupil must begin with material which is on the level of his ability and which possesses the quality we desire the pupil to appreciate. Furthermore, his reading must be guided. That is, he must continue to read literature possessing those qualities the appreciation of which we are trying to develop. It is probably well even in appreciation to drill on one thing at a time.

There are many aspects to appreciation, and a writer may appeal to the reader in many ways. There is what might be called the *problem appeal*, in which the piece of literature stimulates mental activity of an intellectual character. There is another appeal which is closely related to the former, namely, the *association appeal*, as it is called by Ruhlen.²³ In this appeal the literature makes such references as call up the personal experiences of the reader, or such references as cause the reader to remember events described in other readings. Then there is a third appeal, which has reference largely to language. This appeal may be either or both of two kinds: (1) there is the appeal based on a nice choice of words and accuracy of thought; and (2) there is the appeal based on the music or rhythm of the language.

²² Bishop, Merrill, "A Method to Obtain Literary Appreciation," *The English Journal*, 1927, Vol. 16, pp. 199-203.

²³ Ruhlen, Helen V., "Experiment in Testing Appreciation," *The English Journal*, 1926, Vol. 15, pp. 202-209.

Miss Ruhlen performed an experiment in teaching and testing for appreciation in which she used the *Abbott and Trabue Ability to Judge Poetry Test*.²⁴ Milton's *L'Allegro* and *Il Penseroso* were used for the study. She found that the pupils made gains as a result of the teaching, but that the class understood only about 50 per cent of the images after considerable training. This result led to the conclusion that the imagery from which the intellectual and associative appeals come is not within the reach of a majority of eleventh-grade English students even after teaching. Furthermore, she found that *L'Allegro* has but one main appeal, the musical.

The results of Miss Ruhlen's study seem to indicate clearly the importance of knowing the difficulty of the literary selection from the viewpoint of the intellectual problems presented, the background of experience or the information that a pupil has, and the difficulty of imagining the situations presented. Little information is at present available regarding the relative value of specific pieces of literature and the training which they give pupils with different mental ability, social environments, degrees of maturity, and interests. Problems of the future will be concerned with the more exact determination of just what results may be expected when a particular pupil studies a certain selection.

During recent years, several studies²⁵ have been made

²⁴ Abbott, Allen, and Trabue, M. R., "Exercises in Judging Poetry," *Teachers College Record*, 1921, Vol. 22, pp. 101-126.

²⁵ Broening, Angela M., "Developing Appreciation through Teaching Literature," Johns Hopkins University, *Studies in Education*, 1929, No. 13; Coryell, Nancy G., "An Evaluation of Extensive and Intensive Teaching of Literature," *Contributions to Education*, Teachers College, Columbia University, 1927, No. 275; Crow, C. S., "Evaluation of English Literature in the High School," *Contributions to Education*, Teachers College, Columbia University, 1924, No. 141.

through which it was sought to determine the best teaching methods for developing appreciation. In general, it has been found that a detailed analysis of what is to be accomplished by each selection is of advantage. Also, it has been found that extensive reading is of as great if not greater value than a more intensive study of fewer selections. It has also been found that related materials and activities are of the greatest value in developing literary appreciation.

Thought Problems

1. With the knowledge gained in your previous study of psychology, discuss the relation between perception and reading. What is meant by the statement that what the reader gets from the printed page is in a large measure determined by his past experience?
2. What do you regard as the most important aim of reading in the high school? What is the most important objective in teaching literature?
3. If high-school pupils are available, ask each pupil to name (1) the book or selection read during the year in connection with his schoolwork which he likes best; (2) the one read not in connection with schoolwork which he likes best; and (3) which of the two above he likes best. Do you find any age or sex differences?

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For a rather complete summary of studies relating to the psychology of language, see: Adams, S., and Posers, F. F., "The Psychology of Language," *Psychological Bulletin*, 1929, Vol. 26, pp. 241-260; McGranahan, D. V., "The Psychology of Language," *Psychological Bulletin*, 1936, Vol. 33, pp. 178-216.

CHAPTER XI

Psychology of Language — English

The human organism reacts to situations in either one of two ways or in both: (1) by manipulating the stimulus in some way, or (2) by reacting to the stimulus through the use of language. The latter is a secondary type of response. The child reacts in a direct way to a stick of candy when he takes it in his mouth and sucks it. He reacts in a secondary way when he uses his mouth and other speech organs to state his wants.

Language has reference to these secondary responses of man, and it is concerned with such both as situations and as responses. According to the conceptions presented in the preceding chapter, the term *language* includes more than speech and the written symbols. However, we are concerned here primarily with these modes of expression, since our language training is confined mainly to these. For our purpose, we include in the language group spelling, handwriting, spoken and written language, the art of reading, and the appreciation of literature.

Various phases of English taught in different courses. Owing partly to the way in which English teaching developed out of classical teaching, and partly to a lack of well-organized subject matter as well as a lack of knowledge of just what should be taught, the various abilities which enter into that complex which we call language ability are taught in different courses. This fact makes

it exceedingly difficult to always hold in mind the specific purposes which language teaching should serve. Spelling is generally taught as one subject, literature as another, reading as another, and so on. This is necessarily true to some degree, since certain subjects are more closely related to and involve to a larger degree some language skills than others; still, the student should never lose sight of the fact that the purpose and value of all language study are to be found in its contribution to the growth of the pupil as an individual functioning in social situations involving language.¹

General aim of teaching English. From whatever point of view we consider the language problem, we meet the fact that language and thought are mutually dependent. In fact, language and thought seem to be but two views of one and the same thing. Certainly, then, no aim for oral and written English is adequate if it does not recognize this relationship. We may state the general aim of training in oral and written English as the development of the child's ability to react adequately by means of language to the various situations that he meets. This aim has two aspects: language as a tool for thinking as basic to both (1) more adequate expression of response on the part of the child, and, hence, more complete development, and (2) clear, accurate, and meaningful responses for purposes of communication. Too much English teaching of the present is of a vague nature for the following reasons: (1) teachers of English frequently do not know specifically just what they are attempting to do, (2) teachers of English include in their work much which might more profit-

¹See Kimball Young's *Social Psychology*, New York, F. S. Crofts and Company, 1930, Chap. X, for an interesting discussion of the importance of language in social and cultural development.

ably be left to other teachers, and (3) teachers of English are not required to think quantitatively about either their objectives or their results. It is necessary that we know just what we are attempting to do before we can very efficiently set about the task. We ought to know just what results are desired, whether the work assigned the pupil promotes these results, and the methods to be used in securing them.

Language inventory of the pupil on entering high school. Generally, on entering high school, it takes several days for the pupils to get acquainted with each other and the teacher and to become properly adjusted to the new conditions. These days might be used with great profit to the students and more advantage to the school if they were used somewhat as inventory days. If scores made on standardized tests are kept as a part of the pupil's permanent record, these should be thoroughly studied with respect to the group as a whole and to the individual. Many of the better school systems now keep permanent records of the achievements of pupils and pass these on from grade to grade. If these are not available, a battery of language tests should be used.

In addition to the information given by the test scores—which should furnish data concerning the pupils' present language skills—information dealing with the pupils' home conditions and environment, interests and recreational activities, and school history should be sought. These things are important because the child's thought and language are but a mirror of his environmental conditions.

Vocabulary study. Among other things, accurate thinking and expression are dependent upon the vocabulary available. The high-school pupil's writing vocabu-

lary is smaller than either his spoken vocabulary or his reading vocabulary. His reading vocabulary is often far larger than his spoken vocabulary. Vocabulary training is a necessary part of the language program. Additional words must be acquired, old words must take on new meanings, and a finer discrimination in the use of words must be made as new experiences are met and interpreted. Vocabulary training also includes drill in the use of new words as they are acquired. In the case of an old word, additional experiences will often cause a complete reorganization of the meanings conveyed by the word.

The language teacher is frequently so engrossed in English poetry or literature that she finds little time for the study of vocabulary outside her own field. The vocabulary burden of many school subjects, such as history and geography, is heavy. Vocabulary study should be correlated with intellectual interests. The language teacher will find her richest fields for oral and written work in those fields in which the pupils are most interested.

Jenkins² suggests the following steps for extending a vocabulary and making it meaningful:

1. Rapid growth of vocabulary through actual experience and wide reading. Special attention to words and idioms significant in new subjects.

2. Attention to words and groups of words in context whose value will be increased because of intensive work done with them in composition, grammar, and foreign language study. This should be a carrying over of training and should illuminate the context.

3. Intensive study of carefully selected words to show wealth of English language and the values of words in expressing shades of meaning.

² Jenkins, Frances, "The Development of a Meaningful Vocabulary and Independence in Word Recognition," in the *Twenty-Fourth Yearbook of the National Society for the Study of Education*, 1925, Part I, pp. 95-96. Quoted by permission of the Society.

4. Training in making and interpreting definitions, usually depending upon synonyms and illustrative sentences.

5. Training in judging relative values of words in context so that dictionaries and other helps may be sensibly used without over-emphasis on detail.

6. Exercise in classification of words as to thought; arranging word lists under appropriate headings; making lists of synonyms and synonymous expressions, of antonyms, of words with common roots, prefixes, and suffixes.

7. Training in knowing and using all the resources of the dictionary.

8. Testing vocabulary growth by both informal and standard tests.

Extent of high-school student's vocabulary. Undoubtedly children use a much smaller vocabulary than clear and accurate thinking demands. In fact, the think-

TABLE XXVII

MEDIAN PER CENT OF COMPOSITION WORDS
WHICH ARE IN THE FIRST THOUSAND OF THE
THORNDIKE LIST. (*After O'Brien.*)

<i>Grade</i>	<i>Group I</i>	<i>Group II</i>
VII.....	91.2	90
VIII.....	91	90
IX.....	89	90
X.....	88	90
XI.....	87.7	89
XII.....	87.5	88

ing of all people is probably handicapped by lack of vocabulary. Adults frequently are unable to react adequately to a situation because they do not have the mechanism (vocabulary) with which to respond. There are many words in our reading vocabularies which are not in our spoken vocabularies. O'Brien,³ in a study of vocabularies of high-school pupils, came to the conclusion that the func-

³ O'Brien, F. P., "The Vocabulary of High School Pupils," *Journal of Educational Research*, 1925, Vol. 11, pp. 344-355.

tioning vocabulary of high-school students is very limited. He states that the "mere recognition of words gives no definite assurance that they will function in written work." Table XXVII shows the median per cent of composition words which, according to his study, were in the first thousand of the Thorndike list. Group I was composed of pupils from schools with a high-school enrollment of from 150 to 600. Group II was composed of students from schools enrolling less than 150 pupils. Not only did O'Brien find that most of the words used in the compositions came from the first thousand words in the Thorndike list, but he also discovered that from 27 to 40 per cent of the words for the grade group came from what might be called accidental sources, such as the assigned title of the theme.

TABLE XXVIII

MEDIAN SIZE OF RECOGNITION VOCABULARY
OF LOWER-GRADE AND JUNIOR-HIGH-SCHOOL
PUPILS. (*After Symonds.*)

<i>Grade</i>	<i>Vocabulary</i>	<i>Score on Tests</i>
4A.....	4,000	19
4B.....	5,000	24
5A.....	6,000	29
5B.....	6,900	33
6A.....	7,900	39
6B.....	8,900	43
7A.....	10,000	48
7B.....	10,600	52
8A.....	11,250	55
8B.....	12,100	58
9.....	13,200	64

In connection with this study of the words actually used by pupils in their theme work, that of recognition vocabulary made by Symonds⁴ is of interest. He used the

⁴Symonds, P. M., "Size of Recognition and Recall Vocabularies," *School and Society*, 1926, Vol. 24, pp. 559-560.

Thorndike Test of Word Knowledge to determine the recognition vocabulary of junior-high-school students. The results of the study are presented in Table XXVIII. The vocabularies for lower grades are given for comparative purposes.

These two studies show the wide difference between recognition vocabulary and writing vocabulary. Approximately nine-tenths of the words used in theme work by high-school students, according to the first study, belong in the thousand most common words in the English language. The second study shows that high-school pupils have a large recognition vocabulary. The two studies together seem to mean that the high-school pupil is able to react, in terms of words, when reading, to situations to which he cannot react when writing. There are many words in his recognition vocabulary which a little effort would place also in his written vocabulary. Many words are not used because the pupils are not quite sure of their spelling or meaning. Then there are other words which a little drill would make usable. They are not quite in the pupils' written-language habit systems.

Technical vocabulary. In the teaching of any of the high-school subjects, it is important to know whether the pupils have had sufficient experience with the technical words of the subject. "Technical" words are those words which are more or less peculiar to that subject and are not to be found in the general vocabulary of the pupils. The words which make up a pupil's general vocabulary are to be found in the five thousand most common words in the Thorndike list.⁵ One of the chief causes of pupils' failure in the high school is that they are unable to read the

⁵ Thorndike, E. L., *The Teacher's Word Book*, New York, Teachers College, Columbia University, 1921.

material of the textbook. Studies show that one of the main causes of poor comprehension is poor word knowledge. Evidently the teaching of any high-school subject involves, among other things, the problem of aiding the pupils to acquire the special vocabulary needed.

TABLE XXIX

TECHNICAL VOCABULARIES OF THE VARIOUS HIGH-SCHOOL SUBJECTS.
(After Pressey.)

<i>Subject or Field</i>	<i>Essential Vocabu- lary</i>	<i>Accessory Vocabu- lary</i>	<i>Unneces- sary Vocabu- lary</i>	<i>Total Vocabu- lary</i>
Common Mathematics List.	117	26	—	143
Arithmetic.....	83	274	49	406
Algebra.....	151	116	—	267
Geometry.....	196	184	—	330
Common Language List....	145	68	—	213
English Grammar.....	11	31	—	42
Latin Grammar.....	22	30	—	42
French Grammar.....	15	69	—	84
German Grammar.....	20	39	—	59
Literature.....	305	509	21	836
Common Science Vocabulary	191	24	—	215
General Science.....	916	648	—	1564
Biology.....	675	677	41	1393
Chemistry.....	765	488	44	1297
Physics.....	709	331	—	1040
Geography.....	313	690	129	1132
Physiology.....	293	493	80	866
History.....	542	503	—	1045
Art.....	138	202	—	340
Music.....	279	124	—	403
Home Economics.....	1189	433	32	1654
Manual Training.....	365	390	—	755

In the study by Pressey,⁶ an attempt was made to determine the technical vocabularies of most of the high-school subjects. Words peculiar to each subject were se-

⁶ Pressey, Luella C., "The Determination of the Technical Vocabularies of the School Subjects," *School and Society*, 1924, Vol. 20, pp. 91-96.

lected by teachers from a wide range of reading in the subject. After the words were selected, they were classified as belonging in one of three classes: essential vocabulary, accessory vocabulary, and unnecessary vocabulary. Table XXIX gives a summary of the number of words of each class and the total number of words for each subject.

Pressey calls attention to the size of some of these vocabularies and to the fact that teachers of foreign languages generally regard the acquisition of from 800 to 1,000 words in a new language a very good accomplishment for the work of one year. The vocabulary burden of a subject is certainly a factor which should be considered in the teaching of it. Again, vocabulary acquisition is a part of the language problem, and the language problem certainly is an important part of the English teacher's problem.

Spelling in the high school. Spelling is one of the elements entering into written composition ability. The development of this ability is important for several reasons. Spelling should be emphasized in the high school because the high-school graduate as a rule has more occasions for writing than does the adult who did not attend high school. Since society penalizes misspellings, individuals who spell poorly restrict their writing vocabulary to those words which they are able to spell. Limiting the vocabulary is not conducive to growth in language ability.

There are several groups of problems involved in teaching spelling in the high school. The two main groups relate to the words which shall be taught and the most efficient methods of teaching and learning. The numerous investigations regarding the words used in written composition have resulted in lists of words selected on the basis of frequency of use. Further investigations reveal

the words most commonly misspelled.⁷ It can be safely stated that we know within a reasonable degree of reliability what words should be taught in each grade. This can hardly be said of methods of teaching and learning.

There is evidence that spelling instruction, when measured in terms of results, is little better than it was fifteen years ago. There are two chief aims for teaching spelling. The first is to develop in the child the ability to spell a word when he needs it. The second is to develop a spelling consciousness. The development of right attitudes toward spelling is of great importance, although it has been largely overlooked by teachers. The constant neglect in high school of drill work on spelling difficulties and the lack of assistance to the student in the organization of his study in spelling are probably responsible for the fact that secondary-school pupils display very little interest in spelling work.

Grammar and language. Formal grammar study is an inheritance from the time when the classical languages dominated the high-school curriculum. As the vernacular came to play a more prominent part in the course of study, it was but natural that methods used in studying Latin should have been adopted for the study of English. For a number of years the study of formal grammar was not questioned. In fact, English study secured a more prominent place in the work of the school as a result of the criticism of the value of Latin, even though it was actually being taught in about the same formal way. The study of grammar seems to have little functional value. The child who grows up in a good language environment de-

⁷ Crawford, Marianne, and Garrison, K. C., "A Study of Words Most Frequently Misspelled by Seventh- and Eighth-Grade Pupils," *Peabody Journal of Education*, 1933, Vol. 11, pp. 78-82.

velops habits of correct usage without realizing that his speech conforms to a highly complicated and rigid set of rules and principles.

A number of studies have been made as to the influence of grammar on correct usage. These have shown that little relationship exists between correct usage and knowledge of formal grammar. Symonds⁸ points out from a study of Grade VI in four New York city schools that it is the quality rather than the quantity of drill in formal grammar that counts, and that the study of formal grammar is profitable primarily for the superior child, who is motivated by it to generalize. In the same connection, Snedden says:

It seems highly probable that such a study (systematic study of grammar) is of no value whatever to students of less than median intelligence. It is probably also of little or no value to pupils of superior intelligence who have as yet developed no substantial interests in linguistic proficiency.

The systematic study of formal grammar, therefore, should be offered as an elective in junior and senior high schools to those coming from whatever sources who have acquired genuine interests in the subject and are able to show decided progress as a result of their election of such courses.⁹

In view of the fact that experimental results have shown the value of formal grammar study negligible when measured in terms of usage, and in view of the psychology of habit formation, it seems that emphasis should be placed upon carefully controlled drill for habit formation rather than upon the learning of grammar.

Even though grammar has little or no functional values

⁸ Symonds, P. M., "Practice versus Grammar in the Learning of Correct English Usage," *Journal of Educational Psychology*, 1931, Vol. 22, pp. 81-95.

⁹ Snedden, David, *What's Wrong with American Education?* Philadelphia, J. B. Lippincott Company, 1927, p. 297.

in the language development of the pupil, it may have other values. If the function of language teaching is to be realized in the language ability of the child, it must be recognized that language is a social institution and deserves consideration as such. Somewhere in his school career, the high-school pupil should have an opportunity to become acquainted in more than an incidental way with the great social institutions which have been developed by the race. At present there is no unifying thread running through his training in grammar. Grammar should probably be offered as a unit in a course dealing with human institutions.

TABLE XXX

THE CONTENT FIELDS FROM WHICH COMPOSITION TOPICS ARE CHIEFLY DRAWN. (*After Counts.*)

<i>Content Field</i>	<i>Ninth Grade (ten cities)</i>	<i>Tenth Grade (thirteen cities)</i>	<i>Eleventh Grade (twelve cities)</i>	<i>Twelfth Grade (ten cities)</i>	<i>Total</i>
Personal experience.....	10	13	10	6	39
Literature.....	4	6	10	6	26
Current events.....	4	3	7	6	20
Recreational interests...	7	3	4	4	18
Life of school.....	3	4	5	4	16
Science and invention...	3	2	—	2	7
Vocations.....	2	3	1	1	7
Civics.....	1	2	2	—	5
Ethics.....	—	—	1	1	2
Total.....	34	36	40	30	140

Learning and motivation. Perhaps in no field are motivation and interest of greater importance than they are in English expression. The traditional vagueness of themes in composition and the lack of interest in the task on the part of the pupils are well known. If composition is to be effective in the lives of pupils, it must deal with topics of vital interest to them.

Several studies have been made of composition topics. Counts¹⁰ asked teachers to indicate the content fields from which their composition topics are chiefly drawn. The results of this inquiry are given in Table XXX.

Bishop¹¹ made a somewhat similar study in which he asked junior-high-school pupils to express a preference as to the type of theme subject. The material in Table XXXI shows in terms of percentages the responses secured from the pupils. An examination of the table reveals that, as the first preference, 70 per cent voted for themes dealing with personal experiences.

TABLE XXXI

VOTES (GIVEN IN PERCENTAGES) REPRESENTING 10,000 STUDENTS IN 30 JUNIOR HIGH SCHOOLS ON PREFERENCE AS TO TYPE OF THEME SUBJECT.
(After Bishop.)

Ranking	1	2	3	4	5
I. Personal Experience Topics.....	70.	23.4	0.0	6.7	0.0
II. Imaginative Themes.....	20.	36.6	23.4	10.0	10.0
III. How to Do or Make Things.....	6.7	13.4	43.3	10.0	26.6
IV. Current or Community Problems..	0.0	13.3	20.0	40.0	26.
V. School Expeditions and Community Enterprises.....	3.3	13.3	13.3	33.3	36.7

In the study by Shekell,¹² a comparison was made of (a) having pupils write compositions upon some subject of their own preference and (b) having them write compositions from stories read by the teacher. Eighty-eight junior-high-school pupils were studied for a period of twenty weeks. Shekell found that, although a theme may be of a higher type and present more unusual structure and

¹⁰ Counts, G. S., "The Senior High School Curriculum," *Supplementary Educational Monographs*, 1926, No. 29, p. 38.

¹¹ Bishop, Merrill, *op. cit.*

¹² Shekell, O. M., "An Experiment in Teaching English Composition," unpublished master's thesis, Indiana University, 1928.

words when it is reproduced from a story read, the pupils improve more in their general composition ability when they write themes upon subjects of their own choice.

To assign a theme simply because the course of study calls for composition work on certain days or at certain intervals is psychologically wrong. Interests and experiences of the individual should be the basic foundation for expression. The work in oral and written expression should be definitely correlated with the other work of the school and with the pupils' outside interests and activities. Pupils who have been assigned artificial tasks and have been told to draw on their imagination often develop such habits of thinking that language work has no relation to their everyday experiences. Too often teachers in the language fields look upon language from a content viewpoint and fail to see its functional significance.

Learning and intelligence. Several factors involved in the problem of learning a school subject that are generally recognized may be stated as follows: (1) intelligence, (2) pupil interests, (3) proper motivation, (4) previous learning or accomplishment, (5) size of instructional unit, and (6) social environment. There are other factors which influence pupil achievement, but these are the main ones.

The relation of intelligence to learning has been studied in two ways. In the first, tests have been given for the purpose of securing measures of intelligence and achievement in English. In general, the relation between the two sets of scores thus secured has not been as high as one would expect. The reason for this result lies partially in the unreliability of our instruments for measuring English expression and partially in undesirable attitudes on the part of pupils toward English expression. The correla-

tions exhibited in Table XXXII indicate that only a fair degree of relationship existed between the scores made by 127 senior-high-school pupils on a mental test and their scores on certain English tests.

TABLE XXXII

CORRELATIONS BETWEEN MENTAL ABILITY AND
ENGLISH ACHIEVEMENT. (*After S. C. Garrison.*)

Otis S-A Mental Ability

<i>Cross English Test</i> .....	.54
<i>Nassau Hillegas</i> .....	.37
<i>Kirby Grammar</i> .....	.29
<i>Wilson Language Error</i> .....	.31

Correlations between the *Miller Mental Ability Test* and the tests indicated in Table XXXIII show a slightly closer relation. These correlations are based on results from 122 rural high-school seniors from Davidson County, North Carolina.¹³

TABLE XXXIII

CORRELATIONS BETWEEN INTELLIGENCE TEST SCORES
AND SOME LANGUAGE TEST SCORES OF HIGH-SCHOOL
SENIORS

*Miller Mental
Ability Test*

<i>Thorndike Test of Word Knowledge</i> .....	.62 ± .04
<i>Thorndike McCall Reading Scale</i> .....	.40 ± .06
<i>Briggs English Form Test, Beta</i> .....	.63 ± .04
<i>Hudelson Composition Scale</i> .....	.60 ± .04

Alvah H. Lauer and J. E. Evans reported the results of a statistical study showing that "English aptitudes seem to be the most closely associated with intelligence as measured by the conventional type of group test" and that "English is most significantly correlated with success in

¹³ Garrison, K. C., and Bivens, Curtis, "Correlations Between Various English Abilities and Intelligence," *Peabody Journal of Education*, 1931, Vol. IX, pp. 77-79.

high school as measured by grades.”¹⁴ They also found that English aptitudes are most closely associated with intelligence as measured by group tests.

Zelma Langdon Huxtable, in making a survey of composition ability of junior-high-school pupils, found that a high correlation exists between a pupil's intelligence quotient level and the complexity of thought which he expresses, and that the tendency to unify thought is increasingly consistent with the higher intelligence quotient levels.¹⁵ A study of I. Q. as determined by the *Terman Group Test of Mental Ability* and subsequent high-school achievement was made by Shewman.¹⁶ The I. Q.'s for the students were determined at their entrance to high school and again in their senior year. It is interesting to note that the I. Q.'s and English achievement gave a correlation of .70 (n 260), while the entering and senior I. Q.'s gave one of .72. In other words, for these pupils an intelligence test given at entrance to high school predicted English achievement practically as well as it did I. Q.'s at the end of the high-school period.

Another way of studying the relation between intelligence and English achievement is to divide the pupils into groups on the basis of intelligence test scores and to study the achievement of each group. In a study of 319 tenth-grade pupils, the *Otis S-A Test*, the *Nassau Hillegas*, and the *Cross English Test* were used. The pupils were divid-

¹⁴ Lauer, Alvah H., and Evans, J. E., "The Relative Predictive Value of Different High School Subjects on College Grades," *School and Society*, 1930, Vol. 31, pp. 159-160.

¹⁵ Huxtable, Zelma Langdon, "Criteria for Judging Thought Content in Written English," *Journal of Educational Research*, 1929, Vol. 19, pp. 188-195.

¹⁶ Shewman, W. D., "A Study of the Intelligence and Achievement of the June Graduating Class of the Grover Cleveland High School, St. Louis," *School Review*, 1926, Vol. 34, pp. 137-146 and 219-226.

ed into four approximately equal groups according to intelligence test records. The average score made on each English test by each group was then found. The results are presented in Table XXXIV. They show that the brighter pupils as a rule do better work.

TABLE XXXIV

DISTRIBUTION OF AVERAGE COMPOSITION AND
ENGLISH SCORES AMONG FOUR GROUPS REPRESENTING
FOUR DEGREES OF INTELLIGENCE.
(After S. C. Garrison.)

Group	Nassau Hillegas	Cross English
I.....	7.1	138
II.....	6.7	131
III.....	6.3	127
IV.....	5.7	112

The relation between intelligence and language ability is undoubtedly much closer than our test data show. It is a generally accepted conclusion that our tests for use with high-school students are not as reliable as is desirable. This deficiency is due to a number of factors which have already been explained.

Language and social pressure. If language is to meet the needs of social groups, it cannot be wholly static. Increased complexity of life demands a more complicated and subtle type of thinking. If a high cultural level is to be attained, a more or less uniform level of language excellence must be developed. For progress to be made, people approaching questions of importance must be able to understand them and "think them through" with nearly the same efficiency.

Language improvements come largely through social pressure exerted upon the individual. A desire to use good English will lead to more permanent results than will a complete memorization of grammatical forms. Hence,

training in appreciation of good language and literature, together with the development of a critical attitude and a social sensitiveness to language errors, is necessary. Materials must be interesting and adaptable to the development of the pupils for which they are used. Language comes to be more than a series of correctly written sentences; it is transformed into the medium through which the pupil conveys his individual emotions and thought reactions to the group as a whole in a smooth, lucid, and effective way.

Association plays such a leading part in the type of expression used that an improved English environment serves to affect even the least concerned. With this improvement, the general English level will be elevated. However, such improvement depends on the employment of vital and effective means to create a language consciousness among so large a group. If general advancement is made in English, pupils must be permitted to "live the English," safeguarded by proper environmental control, rather than have it taught to them. Conditions for a full "language-life" giving each child opportunity for complete development in his own manner and style of expression must be provided within the school. Only by active participation can proper and effective language habits be formed. There must be social stimulation which will create a desire on the pupil's part for improved methods of expression and cause him to exert the effort necessary to make personal advancement.

Errors and learning. In connection with a study of the errors made by children, it should be remembered that errors are the result of habit formation, just as is correct usage. Errors are not the result of haphazard responses. They obey definite laws of habit formation. The develop-

ment of desirable language habits is not easy because poor habits must generally be overcome first. It is not a case of starting with no training, for the child comes to the high school with language habits pretty well formed, and in many cases during his entire school career he lives in an environment where he hears only poor language usage.

The persistency of technical errors in English composition through the four years of high school, therefore, is a clear illustration of the lack of diagnostic testing in relation to the learning process. One of the earliest and probably most thorough studies of such errors as related to learning was conducted by Johnson.¹⁷ As data for the study, three class exercises from freshmen and graduates of the Kansas City High Schools were secured. The errors made in the exercises were classified and tabulated.

An examination of the data in Table XXXV shows an increase in the number of errors of two kinds, the use of modifiers and capitalization. In most of the other types of errors there is considerable decrease, but not what one would expect. This table shows the necessity for specific training after diagnosis has been made. It also shows the need for recognizing the fact that language ability is composed of a multitude of specific habits. Training for correct usage cannot be secured through a vague general training, but must come through definite drills. In this connection it is interesting to note that Willing¹⁸ found that errors have little relation to each other and that it is practically impossible to predict from one type of error to another. The class of error showing least decrease in

¹⁷ Johnson, R. I., "The Persistency of Errors in English Composition," *School Review*, 1917, Vol. 25, pp. 555-583.

¹⁸ Willing, M. H., "Valid Diagnosis in High School Composition," *Contributions to Education*, Teachers College, Columbia University, 1926, No. 230.

Table XXXV is taken as the most persistent. This table is important in that it shows for what type of error drill is needed most.

TABLE XXXV

ORDER OF PERSISTENCY OF THE VARIOUS TYPES OF ERRORS.
(After Johnson.)

1. Mistakes in the use of adjectives and adverbs.
2. Mistakes in capitalization.
3. Mistakes in the use of the apostrophe.
4. Failure to express clear meaning.
5. Mistakes in the use of prepositions and conjunctions.
6. Mistakes in punctuation.
7. Mistakes in the use of pronouns (not in case).
8. Mistakes in the use of verbs.
9. Careless omission or repetition.
10. Mistakes in the use of quotations.
11. Mistakes in spelling.
12. Miscellaneous mistakes.
13. Mistakes in case.
14. Ungrammatical sentence structure.

Probably the most important fact brought out in the study is that the same group of pupils make the same types of errors in composition involving different subject matter. The writer states:

At every turn of the investigation we face the fact that English error is not a variable, inconstant thing, as those who temperamentally rebel against the standardization of composition work often tell us, but that it is a very constant, tangible thing capable of scientific treatment and study. It shows itself subject to the laws of habit rather than to the laws of chance in its recurrence; and the only possible conclusion is that our general abstract instruction in English composition must be accompanied by strenuous applications of concrete, definite drill—not haphazard practice. Fight old habits with new habits through the medium of drill—mechanical drill in the mechanics of writing.¹⁹

¹⁹ Johnson, R. I., *op. cit.*, p. 579.

Rodgers²⁰ made an analysis of the errors made by 29,000 junior-high-school pupils of Los Angeles in written composition work. She found that 82.9 per cent of the errors could be classified as of twenty-four types. The most frequent errors were: (1) the failure to capitalize proper nouns and proper adjectives, (2) the misuse of the verbs *shall* and *will*, and (3) the wrong form of verbal contractions. The results from this study are presented in Table XXXVI.

TABLE XXXVI

DISTRIBUTION OF 7,784, OR 82.9 PER CENT, OF THE ERRORS OCCURRING AMONG JUNIOR-HIGH-SCHOOL PUPILS. (After Rodgers.)

1. Capitals with proper nouns and adjectives.....	1,103
2. <i>Will</i> for <i>shall</i> and vice versa.....	1,015
3. Misuse of verbal contractions.....	649
4. Use of needless adverbs.....	527
5. Omission of preposition.....	460
6. Misuse of possessive case.....	396
7. Misuse of <i>to get</i>	349
8. Misuse of number.....	332
9. Use of terminal preposition.....	330
10. Misuse of <i>to go</i>	279
11. Use of <i>sure</i> for <i>surely</i>	253
12. Omission of article.....	226
13. Failure to use infinitive.....	241
14. Misuse of abbreviations.....	208
15. Misuse of <i>lot</i> and <i>lots</i>	199
16. Use of figures for numbers.....	185
17. Omission of the subject.....	169
18. Wrong preposition.....	152
19. Use of adjective for adverb.....	147
20. Misuse of past tense.....	135
21. Misplaced adverb.....	124
22. <i>&</i> for <i>and</i>	121
23. Misuse of perfect tense.....	101
24. Misuse of present tense.....	83
Total.....	7,784

²⁰ Rodgers, Grace S., "A Critical Study of the Grammatical Errors of Junior High School Pupils," *Journal of Applied Psychology*, 1932, Vol. 16, pp. 421-426.

a. *Capitalization.* Symonds conducted a study of the frequency with which children make errors in capitalization. He found a continuation of the error in the capitalization of the common nouns, but a falling off of the failing to capitalize the first word of the sentence. Through the literary experiences of the subject, the habit of capitalizing the principal words of literary titles is established. In general, there is a gradual and continuous growth in the elimination of errors in capitalization. One usually looks upon this as one of the simplest types of grammatical error found; however, it is very common among elementary-school pupils. It is only through certain simple but meaningful rules that the correct habit in this case is established.

b. *Punctuation.* A survey of the punctuation errors existing at various grade levels reveals conclusions somewhat similar in nature to those drawn in regard to English errors. It is found that errors tend to persist throughout the grades. The extent to which this is true would indicate that the modern techniques are not effective in eradicating errors in punctuation. These errors are of various types, but the comma error is the one most frequently found. This error in itself is of many types. Especially do we notice this error where it is necessary to set off clauses. There seems to be a decline in the simple omission of periods. There is, furthermore, an increase in the simple comma errors from grade to grade. This increase is to be explained on the basis of the progress in using complex sentences in which clauses are to be set off.

Guiler,²¹ in studying the errors of the punctuation type most commonly found in the work of 640 high-school

²¹ Guiler, W. S., "Analysis of Punctuation Errors," *Educational Method*, 1931, Vol. 10, pp. 425-429.

pupils at the University of Miami in the years 1928 and 1929, arrived at the following conclusions:

1. Many of the high school graduates exhibited marked weakness in the ability to punctuate; a considerable number were deficient in several usages which supposedly had been taught in the primary and intermediate grades of the elementary school.

2. The students varied greatly in their mastery of the total field and in their mastery of specific usages.

3. The error quotient was found to be much superior to frequency of error as a means of discovering the prevalence of punctuation difficulties.

4. Training in punctuation was not found to transfer from one usage to another in any significant degree.

5. Only a few punctuation usages offered any great difficulty for large numbers of students.

6. The data evidenced a need for a liberal proportion of individualized instruction as an economical means of mastering the specifics of punctuation usage.

c. *Sentence structure.* Another consideration is sentence structure. This has been characterized as follows: "Sentence structure in a language is a key to the logic and structure of thinking, inasmuch as the sentence is the smallest complete unit of thought."²² Since it is essential to well-balanced, intelligent composition, it is vitally necessary that each child master this unit, that he may convey his ideas vividly and forcefully through oral and written expression.

Concerning the position of errors in the school grades, Symonds and Daringer conclude from their studies:

Certain errors have large frequency throughout. Weak, broad, or divided reference of pronouns is the most prominent error in sentence structure throughout the whole school

²²Symonds, P. M., and Daringer, Helen, "Studies in the Learning of English Expression: No. IV—Sentence Structure," *Teachers College Record*, 1930, Vol. 32, p. 50.

program, maintaining either first or second place. Vaguely related clauses strung together with or without conjunctions constitute also a common fault through the ninth grade, after which time they begin to yield in importance to other errors. Some errors, of which misplaced modifiers are an example, assume greater importance in the later years in school, while others such as "clauses not balanced" are more serious in the early grades.

In general, however, an error tends to maintain the same relative position. It seems strange that the "comma blunder" error should persist so prominently throughout the whole program. Probably what happens is that even with more mature thought and expression the problem still remains and the old tendency of running sentences together tends to reassert itself.²³

Early versus more recent methods of language work. Studies of the methods that have been commonly used in developing mastery in language usually refer to them as "the work in English in the high schools." Such terms as *literature appreciation*, *cultural development*, *formal grammar*, and the like, are usually employed in this work. These are familiar terms in which it has been assumed that the study of the general structure of the language will insure the mastery of such.

As was before stated, the student who studied Latin some years ago can appreciate the fact that the early methods used in teaching English were borrowed from those then being used in connection with the Latin work, which was a very important part of the school curriculum. The language curriculum was, thus, centered around the English work, and the materials were organized around structure and facts without reference to the functional value of such materials. The general philosophy in vogue at that time was that facts gathered, whether related or not, would build up a scholarly type of mind.

²³ *Ibid.*, pp. 59 and 63.

It is not implied that the fundamental laws of contiguity and similarity were not recognized, for we note that these were present in the early writings of Aristotle. However, it has been only within recent years that we have come to a fuller conception of the nature of learning and its functional value and to reject learning as an end in itself.

Modern methods of teaching are based upon this functional concept of education. Education is, thus, being defined in terms of "reading adaptation," "hand-writing adaptation," "social adaptation," and the like. Again, we note that education is considered in terms of learning. Learning is further referred to in terms of (1) a change in the attitude of the individual, (2) the acquisition of a special ability, or (3) the attainment of some form of skill in manipulating instruments or materials.

The need for individualized work. Emotional efficiency demands, on the part of the organization of the language work, individual rather than group instruction. Gifted pupils must have opportunity for development under supervision, unhampered by meaningless rules and an adverse school environment in fields other than the English work. Thought in language development should center around ultimate objectives and social needs rather than the fulfillment of certain immediate requirements that are well-nigh valueless functionally. Specific requirements and a general rating of progress on the basis of immediate recall of factual materials have given rise to a method of intensive drills on materials set up for completing a specific unit of work. Thus, the language development has centered around minutely detailed course materials rather than the development of pupils with automatic language habits that are of real, functional value.

A more highly and comprehensively trained teaching staff, coupled with a decentralization of specific curriculum requirements, will aid in furthering the cause of an adequate language development. Interest should, thus, be shifted to the development of the individual, and less emphasis should be centered on subject matter as such.

a. *A greater necessity for remedial teaching.* In this connection Guiler concludes from a study of the improvement of ability in sentence structure of a group of ninth-grade pupils:

Several of the ninth grade pupils manifested outstanding ability in sentence structure. Five pupils attained scores which were higher than the median score for college freshmen.

Many of the pupils exhibited marked weakness in sentence structure. Several were deficient in the application of principles which presumably had been mastered in earlier grades.

A distinct need for much individualized remedial instruction was apparent.

Marked improvement in sentence structure ability may be expected when a remedial program first discovers specific principles whose applications are difficult for the group and for individuals and then provides self-teaching and practice materials of types definitely suited to individual needs.²⁴

The need for co-operative teaching. Acceptable writing and speaking should be required in all classes. This requirement will aid in developing a language consciousness on the part of the individual pupils. Furthermore, it will afford a much greater opportunity for practising and living correct language habits. The present practice of leaving all language work to the English department will not provide adequate opportunity for the development on the part of the pupil of those language habits that will best serve his future individual and social needs. Further-

²⁴ Guiler, Walter S., "Improving Ability in Sentence Structure," *Peabody Journal of Education*, 1931, Vol. VIII, pp. 223-237.

more, teachers should come to recognize and study more carefully the reading habits and abilities of the individual pupils. Provision should be made for remedying faulty reading habits. It should be set forth as a fundamental principle of the school program that the speaking skills, the writing skills, and the reading skills are necessary to ordinary success. These primary objectives must be supplemented by higher objectives present in the various phases of the school program.

The teachers of all subjects must come to recognize their responsibility as teachers of language. There is a need for specific plans for co-operation of all teachers in the development of correct language habits.

In line with the agreement that correct language habits can never be the product of any one classroom nor of any one set of experiences we have the following suggestions from a committee report on "College Entrance Requirements in English" presented by E. L. Miller:

English is a set of habits; to get anywhere in good English, students must get everywhere in good English. It is not practical to expect teachers of other subjects to expend the same meticulous care upon expression that the teachers of English do. But it is clearly possible to attain a degree of attention somewhere between meticulous care and complete neglect, and this degree ought not to depend upon the individual teacher of other subjects but upon some common agreement and effort. There are, as has been intimated, degrees of attention, and teachers of other subjects might well be encouraged to begin with a slight measure of co-operation and to increase their help as results are demonstrated to be worth while. Some suggestions gleaned from effective practice follow.

1. Stress excellent work in various subjects by posting the best papers conspicuously on bulletins or in display cases. Excellent work in any subject must involve reasonable handling of content and presentable form. (Praising

the good rather than condemning the bad is probably the more fruitful practice throughout.)

2. Students may be allowed or encouraged to submit excellent papers from other subjects, either in lieu of some written project in English or for additional credit.

3. Schools may set up very definite minimum standards for oral and written work in all subjects and make a co-operative effort to maintain them.²⁵

Various other studies relative to co-operative plans for carrying on the English work have been conducted. These studies show that pupils may be influenced to carry over into their other schoolwork, and especially to written work, the English habits acquired in the English class.²⁶ Such studies are related to the general problem of transfer, and, if we consider transfer, it becomes apparent that it is possible to affect the other work in school considerably by establishing a desirable attitude toward language in general.

Developing desirable attitudes toward oral and written expression. One of the most important problems of instruction in each field relates to attitudes toward schoolwork. Pupils may have desirable attitudes in certain phases of the school's activities and undesirable ones in others. Every activity in which we engage has a personal as well as a more objective significance. Attitudes have reference to situations, conditions learned in the same way that English usage is learned. The methods by which they are learned are harder to describe, and developments

²⁵ Miller, E. L., "College Entrance Requirements in English," *The English Journal*, 1931, Vol. 20, pp. 626-640.

²⁶ See especially: Vose, Ruth M., "Co-operative Teaching of English in the Secondary Schools," unpublished master's thesis, Department of Education, University of Illinois; and Shepherd, E., "The Attitude of Junior High School Pupils Toward English Usage," *The School Review*, 1926, Vol. 34, pp. 574-586.

are more difficult of measurement, simply because they are more subjective in nature.

The factors which aid in establishing attitudes on the part of pupils toward English usage have been well summarized by Shepherd as follows:

1. Instruction should be individualized to meet the specific needs of each pupil, and the pupil should be kept conscious both of his need and of his opportunity to receive instruction.

2. Pupil responsibility for using what is learned in the English class should be emphasized in every possible way.

3. Co-operation of other departments with the English department should be secured and made obvious to the pupils by such devices as the following:

- a. Sending papers from science, geography, art, and other classes to the English room for practice material.

- b. Using such papers rather than, or in addition to, English papers as a basis for securing evidence of pupil needs and pupil progress, and making sure that pupils know their papers are being used.

- c. Encouraging pupils to be interested in matters of usage in general and in their own problems in particular.

- d. Encouraging pupils to ask for help in matters that puzzle them—for example, in correcting mistakes marked by teachers of other subjects.

- e. Giving publicity to every phase of co-operation, encouraging and commending it at every opportunity.

- f. Encouraging and commending efforts at self-correction as the prime evidence of approaching mastery, the goal of effort.

- g. Maintaining favorable writing and speaking conditions in other classrooms, especially—

- (1) Time (even for slow pupils) to write without haste.

- (2) Time and encouragement to proofread all papers.

- (3) Requirement of no more than a reasonable amount of written work.

- (4) Clear consciousness in pupils that careless or

slovenly work will not be accepted by the teacher.²⁷

The proper attitude toward good usage is a matter of habit formation. When pupils see language as human behavior and realize the important part which it plays in their lives, we expect them to attempt to use correct expressions in all phases of schoolwork. However, so long as English teachers see language as structure, and so long as teachers of other subjects do not see the relation between expression and thought in their subjects, we may expect undesirable attitudes toward good usage.

Variety of elements listed under "English." As stated in a preceding paragraph, there are a number of subjects listed as "English." The English course in the high school is usually a combination of several courses found in the elementary school. There we find handwriting, reading, spelling, dramatization, and oral and written composition. Because of the many new subjects which appear in the upper-elementary and junior-high-school grades, these and other various elements of English are usually combined into one course.

The fact that the various elements mentioned above are combined into one course in the high school greatly complicates the language problem. Then, too, different teachers emphasize different elements of language in teaching. Furthermore, children come to the high school with unequal native ability and probably with unequal abilities to learn the individual elements which may be presented in the language course. Not only do children differ in native ability, but their ability to learn is further

²⁷ From Shepherd, Edith M., "The Attitude of Junior High School Pupils Toward English Usage," *The School Review*, 1926, Vol. 34, pp. 574-586.

conditioned by previous training. Few teachers emphasize equally in their teaching all the elements which enter into general language ability. As a result, students enter the high school with various degrees of ability in these specific elements. Some pupils have poor ability in spelling, others are poor in handwriting, and still others are deficient in one or more of the factors entering into general language ability.

Among pupils entering high school there are not only differences in specific abilities, but also differences due to the way these abilities affect each other in the total complex. For example, a student who has poor spelling ability, inferior writing ability, faulty sentence structure, and the like, will usually use a much narrower range of his ability than will a person who has superior ability. This circumstance tends to limit his growth, since he continually uses a restricted range. At the same time, he develops habits of thought and work which make for a low level of achievement. It follows from the above that an intelligent teaching program will be based upon a study of the abilities of each pupil in the class, and the materials, methods, and activities to be employed in connection with it will be selected on the basis of the needs and abilities of the group.

Not only should the English teacher make an inventory of the language abilities possessed by the pupils, but he should also have access to records of their mental ability secured by the administration of a good intelligence test. During the first few days of the term, while the teacher and pupils are getting acquainted preparatory to systematic work, giving good inventory tests is of decided advantage. Standardized tests and scales are now available for measuring most of the elements involved in general

language ability. Items in English which can now be measured by standardized tests and scales have been enumerated as follows:

1. Ability in handwriting.
2. Ability in spelling.
3. Ability to sense completeness of expression (sentence sense).
4. Ability to capitalize and punctuate the sentence after it has been written.
5. Ability to choose desirable words (vocabulary).
6. Ability to compose paragraphs (rated on scales).
7. Knowledge of grammatical terms and rules.
8. Ability to apply grammatical terms and rules.
9. Ability to use words correctly as regards grammatical structure, regardless of knowledge of terms and rules.
10. Rate of reading.
11. Comprehension in reading.
12. Familiarity with classic literature.
13. Appreciation of literature.²⁸

It is obvious from the classification given above that there are a good number of measuring instruments which may be used for the purposes of studying pupil achievement and individual differences and of making detailed diagnosis. In no field is specific information as to pupil achievement needed more than in English. There is a definite need for an analysis of what is to be achieved and the organization of specific exercises for the development of specific abilities.

Reading tests. The pupil should master the mechanics of reading before he reaches high school. The aim of instruction in the high school should be to perfect reading techniques in a number of fields. Here the purpose of reading is to extend experiences and so aid in the develop-

²⁸ La Brant, Lou L., "Diagnostic Tests and Remedial Measures for the Teaching of English in the High School," University of Kansas, *Bulletin of Education*, 1928, No. 7, pp. 8-9.

ment of mental content. The work type of reading, on the one hand, and reading for enjoyment, on the other, may require many different types of reading. There are a number of good tests available for the measurement of reading ability in the high school. It must be remembered, however, that reading ability is a very complex affair, and that, since it is not a simple process easily acquired, its measurement and analysis are difficult.

The tests to be used in studying reading ability should be selected on the basis of the aspects of reading which are to be studied. Because of the complexity of the habit, no single reading test will measure adequately all phases of reading ability. If one wishes to make a survey for comparative purposes, speed and comprehension are the factors which it is most desirable to measure. Such measurements will locate entering high-school students who should have diagnostic studies of their reading difficulties.

Tests in literature. Measurement in the field of literature has not kept pace with measurement in other fields. The reason for this lies in the fact that the outcomes of instruction in literature are not so definite as in many other fields of language teaching. Again, teachers of literature usually have had little training of a quantitative nature. As a result, they lack the training and experience necessary for the development of a sympathetic attitude toward the measurement movement.

One of the first attempts to measure the ability of students to judge the merits of literature was made by Abbott and Trabue.²⁹ Two series comprising thirteen sets of four poems each were made available for evaluation in the test. The directions to be followed in connection with each of the thirteen sets of a series are as follows:

²⁹ Abbott, Allen, and Trabue, M. R., "Exercises in Judging Poetry," *Teachers College Record*, 1922, Vol. 22, pp. 101-126.

Read the poems *A, B, C, D*, trying to think how they would sound if read aloud. Write *Best* on the dotted line above the one you like best as poetry. Write *Worst* above the one you like least.

The *Logasa-Wright Tests for the Appreciation of Literature* consist of six tests.³⁰ These tests are somewhat similar in construction to the *Abbott-Trabue Tests* and offer possibilities for the classroom teacher and supervisor. Each test in this series is devised to measure some specific element of appreciation. They are as follows:

Test One—Discovery of Theme.

Test Two—Reader Participation.

Test Three—Reaction to Sensory Images.

Test Four—Comparisons.

Test Five—Trite and Fresh Expressions.

Test Six—Rhythm.

Various tests have been devised for measuring literary information. These tests present an objective approach to the problem of evaluating educational growth and have been standardized on large groups of children. However, the fact that the literature content varies to such a large degree in the various courses of study will limit the reliability of norms thus established.

Vocabulary tests seem to have been developed to meet a diagnostic need in reading, for it is generally agreed that the child who has poor mastery over word-meaning has difficulty with his reading. The method of testing for vocabulary usually takes the form of multiple-choice exercises.

Spelling tests. The chief objective given for the teaching of spelling is the ability to spell correctly the words

³⁰ Logasa, Hannah, and Wright, Martha McCoy, Bloomington, Ill., Public School Publishing Company.

most commonly used in written expression. This ability may be measured with relative accuracy, and a number of extensive word lists, known as *scales*, have been developed. The primary purpose of measurement in spelling is to determine pupil achievement and progress. Spelling tests constructed of words which possess special difficulties, to be dictated to the pupils, serve the purposes of diagnosis. Consecutive measurements by means of spelling tests give high reliability coefficients.

There are a number of causes of poor spelling ability. Although some authors³¹ hold that there are special disabilities in spelling, the weight of evidence seems to be that there are no special spelling disabilities. Poor spelling ability may be the result of a number of causes. Carelessness is one of the most common causes, while poor pronunciation is another. Sensory defects and inferior mentality are often associated with poor spelling ability.

Tests are useful for selecting pupils with poor spelling habits. After such pupils are selected, it is necessary to determine the causes for their condition and the remedial procedures which will be followed. In general, an effort should be made to build up a spelling conscience, and emphasis should be placed on methods of learning to spell. Drill and study are useless unless better methods of work and more desirable attitudes can be developed.

Language and grammar tests. Until recently, tests in language and grammar were limited in number and generally tested only the more formal aspects of pupil achievement. It is difficult to construct tests in the language field which adequately measure the functional aspect of

³¹ Hollingworth, Leta S., "The Psychology of Special Disability in Spelling." *Contributions to Education*, 1918, Teachers College, Columbia University, No. 88.

language usage. As a rule, such tests as have been constructed have been inadequately standardized, and the norms are not always as reliable as one might wish. However, during the last few years there has been a growing interest in measurement in this field, and tests are being devised which yield high reliability coefficients and are useful for survey and diagnostic purposes.

Composition tests. There are a number of scales designed to measure general merit in written composition. The first scientifically constructed scale for measuring quality in English composition was the Hillegas scale.³² There have been a number of modifications of this scale. In fact, most scales devised since 1912 have been patterned more or less after it. The Hillegas scale consists of ten compositions the scale value of which ranges from zero to 9.3.

Thought Problems

1. Why is it that pupils frequently do not like theme work? In your experience, what type of theme subject did you like best?
2. Work out a plan for making an inventory of the language abilities of entering high-school students.
3. Discuss the problem of whether the English teacher is more responsible for vocabulary growth than the teacher of history or mathematics.
4. Study the vocabulary burden of the school subject in which you are most interested. How would you make provision for developing this vocabulary in your pupils?
5. What is the relation between the present study of English grammar and the present study of the classics?
6. Summarize the findings regarding the relationship between language ability and intelligence.

³² Hillegas, M. B., "A Scale for the Measurement of Quality in English Composition for Young People," Bureau of Publications, Teachers College, Columbia University, 1912.

7. What are some of the elements to be measured in the general field of English? Attempt to rank these in the order of difficulty of measurement.

8. How does the problem of measurement in language differ from the problem of measurement in reading?

9. What is the value of a diagnostic test in language and grammar? If possible, give a language test to a group of students and study the scores of the individual pupils.

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CHAPTER XII

Psychology of Modern Languages and Latin

Historical statement. During the eighteenth century, instruction in the high school was confined almost exclusively to the classical languages, Latin and Greek. An investigation of the aims and methods of Latin teaching would reveal a series of changes corresponding to other changes of an historical nature. Latin had been for centuries the chief means of communication between the peoples of different countries. It was the language of the Church. The scholars were usually either monks or lawyers, both servants of the Church. It is but natural that teaching should have been in the language of the Church, and that its purpose and aims should have been dominated by religious aims and philosophies. So long as the Church controlled the schools, instruction was largely in Latin. As the schools developed and education became somewhat more general among the upper classes, a knowledge of Latin became the mark of an educated man and of a gentleman.

Several factors combined to decrease the influence of Latin in the school. Such factors as the coming of the Renaissance, the discovery and colonization of the New World, inventions, the rise of great nations in Europe, all contributed to the entrance of a wide range of materials into the curriculum. As the vernacular became the sub-

ject of study and the means of instruction, and as scientific interest increased, Latin became relatively less important in the educational scheme.

During the last quarter of the eighteenth century and the first quarter of the nineteenth, the modern languages began to find a place in our high-school curriculum. It was not until after the middle of the nineteenth century, however, that the modern languages began to be studied very widely in our high schools. The latter part of that century and the first part of the twentieth marked a rapid spread, while the number of pupils studying Greek did so for disciplinary reasons until the experimental work of the early part of the present century showed that the notions involved in faculty psychology were false. After that time it was easy to claim cultural and practical values as reasons for the study of modern languages. It was not so easy for teachers of Latin to show such values for Latin, however, and as a result Latin declined in importance as a high-school subject while the modern languages rose.

A. Modern Languages

The modern languages usually taught in the high schools and colleges of this country are French, Spanish, and German. There are a few schools in which Italian is taught and in which some branch of the Scandinavian tongue (Norse or Swedish) is also offered. Italian is taught in a few of the larger cities of the East where there is a large Italian population. The high schools in some of the northwestern States having a large Scandinavian population sometimes offer some branch of the Scandinavian language.

The aims of modern language teaching as well as those of Latin should be directly related to the program of the

school. The high school will never be able to develop in many students a functional knowledge of the foreign languages. Language should be taught so as to give pupils an insight into how other people think and live. The high-school pupils will never learn much content from the language, but they will be more appreciative of the fact that there are other great peoples in the world sharing the civilization of the age. Modern language teaching should, therefore, be very closely correlated with the social studies, as well as with other subjects dealing partly with man's institutional life.

Psychological factors involved in modern language study. There are a number of factors which influence the foreign language situation in our schools. In a large part of our country, we are somewhat provincial in our thinking. Our pupils in many places have seldom come in contact with foreigners. They have a feeling that a foreign language cannot be of much use to them. In addition, we have the tradition of "national isolation" and "no entangling alliances." There is a feeling that, if a visitor from a European country desires to converse with us, he must use our language.

Another factor contributing to this condition lies in the fact that students as a rule come in contact only with foreigners who can speak English. Those who cannot are from the lower classes of society, and the student looks with disdain upon them and their language.

There is in America no special motive for studying foreign languages, as there is in Europe. There the student early realizes that his social and economic environment demands that he be able to converse with foreigners. Most educated people in Europe speak several languages, and the languages are emphasized in the school curricu-

lum. In America, on the other hand, many well-educated people have not studied a foreign language, and the native-born American of native stock who speaks a foreign language is rare indeed.

The situation with regard to foreign language speaking and reading in America is such as to develop the attitude that the languages are difficult for our children. This, of course, is not true, but the feeling does very seriously affect foreign language study and learning. Add to this the fact that economic and social motives are lacking, and it can be seen that modern language teachers do have a real difficulty in motivating their work.

Interrelationship of language abilities. It is generally agreed by educators that one should not begin the study of two languages at the same time. In such cases conflicting impulses and interferences of associations are usually being made. After the rudiments of one language are learned, however, they generally aid in the acquisition of another. Especially is this true when the languages belong to the same language group, as Spanish, French, and Italian, or German, Swedish, and Norwegian. In spite of occasional confusion much of the learning in this case is effected by analogy, and therefore the help is more often greater than the hindrance. Probably the widespread belief that Spanish is "easy"—an exaggeration—is due to the fact that it is often taken up after a good foundation of either French or Latin or both has been developed. The majority of French students, it will be found, have had from one to five years of Latin. The best students are able to correlate the two languages so that one is constantly a help to the other. Even languages as different as French and German may each give assistance to the study of the other because of their gen-

eral similarity in basic structure and the fact that the method of attack, so to speak, is similar.

In the correlation of several languages, such as we have been describing, there are involved analysis, reasoning, and judgment. While it is generally agreed that childhood is the best time to begin the study of a foreign language for the purpose of greatest success in speaking, it is nevertheless true that mature students grasp the theory of language formation much more readily than the immature. This facility of the older students is due to their capacity for abstract reasoning and analysis, their ability to isolate the elements of one situation and apply them in situations somewhat similar in nature. The proper study of languages cannot fail to be good training in the observation of finer details. How far such training is transferable to other subjects or to the broader issues of life is, of course, a much discussed question.

Modern languages and educational growth. Most teachers of the modern languages, as well as teachers of the other subjects, do not realize the relationship of teaching and subject matter to pupil growth. When one reflects that the citizenship-culture aim is certainly one of the most important aims in teaching, he immediately realizes the importance of the teacher. No amount of foreign language teaching is worth much if it is not directly related to desirable pupil growth. One wonders whether teaching which attempts to develop a few skills in a field without relating these skills to the larger problems of development is not a condition which leads to disorganization rather than organization.

The language teacher should see the relationship between language and social and individual development. No teacher would attempt to make beginners think in a

foreign language if she knew anything of the psychology of language, the underlying inner speech, and the relationship between thinking and language and language and behavior in general. When we consider that language has two phases, the outer and the inner, and that the former relates to sounds and movements, we can readily see how important a knowledge of the psychology of language is for the teacher. It is essential that the teacher of any language see the relation of that language to civilization as a whole, for even the history of civilization is wrapped up in language. This is the reason why it is so essential that language teachers have a broad outlook on life as well as special training in their field.

Transfer value of modern languages. Teachers of modern languages have never claimed transference of training in their classes so vigorously as those of Latin and mathematics. A number of interesting studies have aided in clarifying some of the problems involved in the question as to whether transfer of training from language study actually takes place.

The study by Limper¹ is of especial interest in relation to the problem of transfer from a foreign language to English. This study was conducted with two freshman classes of Kansas State Agriculture College as subjects. The *Thorndike Intelligence Examination for High School Graduates* was used for determining their intelligence level. The English test scores of these students were then studied in relation to the amounts of a foreign language studied and the intelligence levels.

The results from this study are presented in Table

¹ Limper, L. H., "The Effect of Having Studied a Foreign Language in High School on the Ability of College Freshmen to Use English Correctly," *School Review*, 1927, Vol. 35, pp. 676-680.

XXXVII. They indicate that the study of a foreign language is an important factor in the estimation of one's English score. Limper points out further, "When the English test was repeated at the end of a semester of college rhetoric, the average improvement made by ninety students chosen at random was 3.4. Thus, the superiority of those who had studied a foreign language two or more years over those who had not studied any foreign language was greater in most cases than the improvement made during a semester of college rhetoric."²

TABLE XXXVII

THE AVERAGE SCORES SECURED IN ENGLISH DISTRIBUTED ACCORDING TO INTELLIGENCE AND TIME SPENT IN STUDYING FOREIGN LANGUAGES.
(After Limper.)

<i>Amount of Foreign Language</i>	<i>Intelligence Level (Percentiles)</i>			
	0-35	36-50	51-65	66-100
<i>1925-26 Class (N=837):</i>				
No foreign language.....	36.7	38.5	42.2	45.3
One year of foreign language.....	37.3	39.8	42.4	45.4
Two or more years of foreign language..	40.9	42.8	45.0	48.5
<i>1926-27 Class (N=576):</i>				
No foreign language.....	34.8	38.9	41.95	41.8
One year of foreign language.....	39.2	40.3	41.85	43.3
Two or more years of foreign language..	41.1	42.1	44.50	47.7

The studies by Werner³ indicate that the study of a modern language increases speed and comprehension in reading and ability in grammar, is of questionable value for the development of general language ability, as well

² *Ibid.*, p. 680.

³ Werner, O. H., "Influences of the Study of Modern Foreign Languages on the Development of Abilities in English," *Modern Language Journal*, 1928, Vol. 12, pp. 241-260; and "Influence of the Study of Modern Foreign Languages on the Development of Desirable Attitudes in English," *Studies in Modern Language Teaching (Publications of the American and Canadian Committees on Modern Languages*, New York, The Macmillan Company, 1930, Vol. 17, pp. 99-145.

as of vocabulary growth, and is likely to be detrimental to sentence structure.

Learning and teaching the modern languages. If the learning of a modern language is to be done economically and effectively, several factors of adolescent psychology must be kept in mind. In the first place, the student in the junior and senior high school has reached a place in his intellectual maturation where he is extremely critical of schoolwork which does not seem to be worthy of effort. He no longer is willing to do assignments simply because it is a part of his schoolwork or because the teacher has requested that he do so. His interests are dominated more by the things which seem worthy of him.

Education has overemphasized the knowing side of schoolwork to the neglect of the functional side. Pupils like to *do* as well as to *know*, and it is good psychology, even in language teaching, to provide opportunities for many activities in addition to the regular language drills. Furthermore, the objectives of instruction should be kept constantly in mind, and all facts and principles introduced should function in doing.

Instruction should always be based on pupil experiences. The pupil experience on which the teacher is basing the work may be meager; but, whether she is aware of the fact or not, pupils can interpret present experiences only in terms of old ones. The problem, then, is to find events, subject matter in other courses, visits of foreigners, foreign music and plays, and so forth, that may be used for keeping pupils interested and for purposes of interpretation.

There is considerable disagreement among authorities in the modern language field as to the most desirable methods of teaching. There are two chief reasons for this condition. In the first place, there is little agreement

as to ultimate objectives. This condition exists because a large majority of modern language teachers have very little knowledge regarding the psychology of development and the nature of the ultimate objectives of education in general. The training of most authorities, and especially teachers, in the field of modern language has been disproportionately in the field of language. The second reason why so little is known concerning the best methods of teaching a modern language is a lack of experimentation. In no field is there a greater paucity of experimental literature. There are a few outstanding contributions, such as that of Buswell.⁴ Also, the Modern Language Association is now fostering work of a psychological and experimental nature.

One thing seems certain in the planning of modern language instruction. No one method is best for all pupils. The first task of any teacher is to take stock of her pupils. This is especially true for a teacher of language. Before beginning with any group of new students, the teacher should ask himself such questions as the following: What is their vocational outlook? What is their cultural and educational outlook? In addition to a consideration of the group, individual pupils should receive suitable guidance during the course of instruction. The methods selected must suit a majority of the pupils, yet one must not lose sight of the individual. There are classes from which it is highly probable that no pupil will continue the study for more than one or two years. In such cases, the aim of instruction should undoubtedly be reading. However, there may be a few who plan to go on with the subject. For them the course should be broader.

⁴Buswell, G. T., *A Laboratory Study of the Reading of Modern Foreign Languages*, New York, The Macmillan Company, 1927.

Occasionally there are classes in which almost the entire personnel continues the study. There are sometimes classes from which many individuals go into college, preparing for careers in medicine, engineering, and other scientific fields. Individuals who plan to enter scientific work or who will probably enter such work should receive training somewhat different from those who expect to enter the commercial field.

Direct versus indirect learning. Direct and indirect methods of teaching modern languages are frequently contrasted. By the "direct" method is usually meant interpreting by means of the foreign language alone. As the term is ordinarily used in this country, it designates the oral method, in which English is not used. Handschin sets down the principles of direct teaching as they have been worked out by the best practice in this country as follows:

1. Great care in teaching pronunciation, especially the first weeks and months.
2. Oral treatment of texts, before they are presented to the eye, although reading is the center of the instruction.
3. Grammar taught inductively in the sense to be indicated a little further on.
4. The written work based on matter which has been thoroughly assimilated by hearing and speaking it.
5. Translation to a minimum and barred from *elementary* instruction.
6. Use of *realia*.⁵

The reading method is the other chief method used in this country today. This method has been described in the following manner:

According to this second method the study of the language began at once with the reading of easy German stories, and

⁵From Handschin, C. H., *Methods of Teaching Modern Language*, p. 56. Copyright 1926 by the World Book Company, Yonkers-on-Hudson, N. Y.

ended with a brief, systematic study of grammar. The discussion of the work as conducted falls into several parts, corresponding to the different periods into which it was divided.

The first period of the work, occupying almost three months of time, was governed by the following principal aims:

- (1) To acquire a good pronunciation.
- (2) To learn a relatively large German vocabulary.
- (3) To develop, as much as possible in so short a time, a feeling for the German language, its form and use.

To accomplish these aims the work was conducted as follows: Simple, easy German stories were read aloud, careful attention being given to pronunciation and expression. This reading was done, a sentence or two at a time, at first by the teacher and then by the students. For several periods at the beginning of the work every part of the new lesson was read first in class; and the home work of the students consisted in going over the same work trying to better their first attempts made in class. The meaning of each new word, when not evident from the context, was told in this class study, and the students were expected to remember it next day. Whenever possible the new word was explained by a synonym already familiar to the students.⁶

As was stated previously, the aims of instruction will, in short, determine the methods of instruction used. However, there are several psychological considerations which should be given any method. It is questionable whether any method which attempts to break with the past experience of the learner is psychologically sound. Certainly, if we know anything of learning, it is that all new experiences are interpreted in terms of old ones and integrated with them. It is as impossible for an individual to break with old language habits suddenly as it is

⁶ Quoted by Handschin, C. H., *op. cit.*, p. 59, from Clarahan, M., "An Experimental Study of Methods in Teaching High School German," *Bulletin of the University of Missouri, Educational Series*, 1913, Vol. I, No. 6.

for him to grow new physiological structures suddenly. All new language habits, even those relating to a foreign language, must, because of the nature of the organism, grow out of previous language habits. The direct method as used by many teachers would secure meanings directly from foreign words without going through the vernacular.⁷ This, strictly speaking, is of course impossible. However, individuals may gradually become able to think in a foreign language without going through the vernacular. A danger lies in the fact that individuals with poor psychological training may not realize the intimate relation between language and thinking and may actually try to make the pupil break with his old language habits. Also, it should be remembered that the organism is in its growth, and new habits are merely modifications of the old through the integration of old and new experiences.

Reading a modern language. In a foreign language, as well as in the vernacular, the pupil may engage in two kinds of reading, intensive and extensive. Both kinds are valuable, and the teacher should plan for both in her program of instruction. The aim of intensive reading is to acquire a large vocabulary which will function in extensive reading. Both oral and written work are used in this method. Certain aspects of both oral and written methods have been used by Hagboldt, who lists nine practices which are useful in teaching intensive reading.

1. Reading for pronunciation, intonation, and fluency.
2. Reading to practice inference.
3. Intensive reading for exhaustive grammatical analysis.
4. Reading to practice free translation into good, literary English.
5. Reading for vocabulary expansion by means of induction.

⁷ See Handschin, C. H., *op. cit.*, Chap. II.

6. Reading for literary translation with the sole purpose of demonstrating quickly that all the details have been properly understood.
7. Reading for aural and oral practice.
8. Rapid silent reading in class as a sort of general test of the students' reading ability.
9. Reading and translating as a sort of comprehensive test on pronunciation and fluency in reading aloud.⁸

In addition to the analytical study pupils use in intensive reading, there is need almost from the beginning for a type of reading the primary purpose of which is "to increase the pupil's reading vocabulary, to give him valuable content experience, and to increase his ability in the reading process by affording him abundant opportunity for practice on pleasing, interesting and easy material."⁹

Extensive reading should aim at a knowledge of the content as well as at the acquisition of a large passive vocabulary. With this purpose in mind, there should be much sight reading in class with definite questions based on the content of the material read. Short stories in which the institutions, thought, character, or history of the people whose language is being read is the theme are valuable. In extensive reading the pupil should cover several times as much material as he covers in intensive reading.

One of the first facts which a teacher of any language must absorb is that reading and grammatical study involve quite different psychological processes. Reading involves largely synthetic mental processes, while the study of grammar demands just the opposite—analytical mental

⁸ Hagboldt, Porter, "Making the Reading Lesson Effective," *Modern Language Journal*, 1926, Vol. 11, pp. 129-132.

⁹ Eddy, Helen M., "Course of Study in French for High Schools," *Extension Bulletin*, University of Iowa, May 1, 1924, No. 105, p. 33.

processes. In reading, words do not function independently. The thought unit is the language unit. This may be a word, phrase, clause, or sentence. In grammatical diagnosis, the student responds to each word as a unit, and, as a result, his reading is slow and his understanding of the content is poor. If the student is to read fluently and with understanding and appreciation, he must grasp language units and give his attention to content rather than to grammatical forms. It has been demonstrated that the time required to perceive a letter is as long as that required to perceive a word or a larger language unit.

One of the most extensive investigations relative to growth in ability to read a foreign language was made by Buswell,¹⁰ who obtained photographic records of eye-movements. He points out that students taught a modern language by a direct method attain in two years' study those fundamental habits which are characteristic of the person who reads, while students taught by an indirect method attain these mature characteristics of reading in a much less degree. There is ample evidence from experimentation that attention to technical details is a barrier to rapid reading and mastery of content. The child, learning to read, is unaware that there is a technical grammar underlying language.¹¹ While we are unable to say at present that experimental findings relative to the vernacular can be applied to learning a foreign language, the presumption that such is the case is strong, and, therefore, it would likely be advisable to leave the more analytical aspects of language until such time as the

¹⁰ Buswell, G. T., *op. cit.*

¹¹ O'Shea, M. V., "The Reading of Modern Foreign Languages," *Bulletin*, Bureau of Education, 1927, No. 16.

pupil has definitely acquired a mastery of the reading process.

Vocabulary development. In the development of language in the young child, two steps stand out clearly. First the child acquires a word with a definite group of meanings. The beginnings of language in the child are, thus, sentence-words; that is, words function as sentences. The second step in language development consists in the use of additional words which amplify and make more precise the meanings originally expressed by the single word. Learning a language, then, consists in acquiring words which possess meaning from hearing them spoken or seeing them in written form.

The student of a foreign language, like an infant, should acquire the most useful words first. There are certain words which are highly useful and which may be used somewhat as the child uses sentence-words. There are also other words which are useful because they are needed in the formation of language units—phrases, clauses, and sentences. The Modern Foreign Language Study has sponsored word counts in French, German, and Spanish. The utility of such counts is in the preparation of minimum and essential language needs for a course of study. Breazeali points out the value of such counts in language work where reading is the objective.¹² Twenty-five well-chosen words will form a large number of sentences, and with five hundred words a very large number of useful sentences can be constructed. Such a list of words thoroughly mastered may become the core of a growing vocabulary.

As was previously stated, a pupil's modern language

¹² Breazeali, Elizabeth, "Value and Use of New Word Lists," *Modern Language Journal*, 1931, Vol. 15, pp. 298-299.

vocabulary will be of two kinds: active and passive. The active is composed of the words which the pupil is able to use in either spoken or written communication. The passive is composed of those words which are understood when heard or seen. A passive vocabulary is developed largely through extensive reading. By means of extensive reading, words are interpreted in a wide variety of situations and their meaning when they appear in context is easily secured.

Active vocabulary is usually developed orally and in spoken and written sentences. New words are explained by definitions, actions, pictures, objects, questions, and the like. The aim in developing an active vocabulary is to establish a direct association between the word and its meaning. In this case, new words are introduced gradually and abundant opportunity for their use is given.

It follows from what has been said that all foreign words are not to be treated alike in the learning of a foreign language. The psychological processes involved in the use of a passive vocabulary are somewhat different from those operating the active vocabulary. In the passive vocabulary word-meanings may be secured from the relation of words to the context of the materials in which they are found, or from their similarity to other known words.

Modern language grammar. The purpose, method, and content of instruction must be determined by the needs of the pupils who are to be taught. No teacher should undertake to use the same method on every pupil or group of pupils. The problem of grammar cannot be settled by any rule of thumb. The grammar which should be taught and the method to be used must be decided in view of the needs of a majority of the class, although pro-

visions must be made for the minority of the class in all cases.

Within fairly recent years, the problem of grammar has shifted from that of formal discipline to the question of the relation of grammar to specific language skills. Grammar in modern language should not be designed to aid the student in the development of reading ability, for there is evidence that pupils would get along very well in reading without it. Children who know nothing of English grammar learn to read well; why should the modern language student not do likewise? The question of correct language structure is important in this connection. Starch found that, with reference to correct structure, knowledge of grammar has very little functional value. He concludes from experimental data:

Incidentally the implication may also be pointed out that knowledge of *grammar* has very little effect upon correct usage. The large increases in grammatical knowledge are accompanied by only very small increases in correct usage. Correct usage is primarily a matter of establishing correct habits of speech, and grammatical knowledge is useful only in so far as it helps to establish such habits. Apparently imitation and repetition of correct expression are far more efficacious in forming correct habits than grammatical knowledge. The recent tendency to reduce the time devoted to formal grammar and to postpone the study of it to later years is in accord with these findings.¹³

If grammar is taught at all, it should not be taught as a formal subject. Rules should be treated as a method of summarizing facts and principles found in the reading matter. After the facts have been summarized, a few sentences should be used by way of illustration. It must be remembered that grammar has certain values for the

¹³ Starch, Daniel, "Some Experimental Data on the Value of Studying Foreign Languages," *School Review*, 1915, Vol. 23, pp. 697-703.

student aside from any value it may have in aiding him in his reading. From the point of view of language as an institution, a knowledge of grammar is of the utmost importance. The language of a people tells much of their cultural history. In one experiment, at least, the pupils acquired a fair amount of grammatical knowledge without having studied grammar as grammar.¹⁴

Pronunciation. There is little experimental evidence on the relation between ability in pronunciation and ability in reading. Reading probably always involves a certain amount of inner speech. Perhaps practice in the oral reading of a language is necessary for the development of a good silent reading ability. If skill in silent reading is the only aim in language study, it is questionable whether much time should be spent on drill in pronunciation. If, on the other hand, the language is being studied for leisure and cultural values, it appears that oral reading ability—pronunciation—is important.

A considerable amount of drill is necessary in teaching the pronunciation of a foreign language. Drill often becomes tedious to the high-school pupil. The teacher with imagination is able to motivate by the employment of varying methods or by the use of short language units carrying interesting content. Jokes, proverbs, and the like, make useful drill material. There are good psychological reasons for securing concerted pronunciation by the whole class before calling on individuals.

The teacher is the most important factor determining the success of the pupils. It is needless to state that the first prerequisites on the part of the teacher are a correct, fluent pronunciation day by day throughout the year and

¹⁴ Bovée, A. G., "Grammatical Knowledge and Reading Ability in French," *Journal of Educational Research*, 1925, Vol. 11, pp. 204-212.

the ability to inspire his pupils to effort. The teacher must never allow incorrect pronunciations to go uncorrected and he must make certain that correct habits are firmly established from the very first.

Mental ability and achievement. Kaulfers¹⁵ collected data during the second semester of the year 1927-28. The intelligence quotients of 1,002 pupils were derived from their performance on the *Terman Group Test of Mental Ability*, Forms A and B. Certain of their marks in Spanish were available. These pupils were enrolled in eighteen junior and senior high schools in San Diego and Los Angeles and had studied Spanish for from one to six semesters. The average grades were translated into point-score equivalents on the basis of their standard deviation distances. The coefficient of correlation between intelligence and grade-point average was then computed for each of the six semesters. These correlations are presented in Table XXXVIII.

TABLE XXXVIII

CORRELATIONS BETWEEN INTELLIGENCE TEST SCORES AND GRADE-POINT AVERAGES. (After Kaulfers.)

Semester	Boys			Girls		
	Number of Cases	Correlation	Probable Error	Number of Cases	Correlation	Probable Error
1.....	77	.4255	.0629	72	.5310	.0563
2.....	120	.2109	.0559	137	.4079	.0478
3.....	79	.1503	.0742	108	.3197	.0578
4.....	78	.1113	.0755	123	.3842	.0516
5.....	47	.0315	.0973	60	.3579	.0758
6.....	24	.0892	.1366	33	.1429	.1141
Total..	434	.2299	.0307	568	.3911	.0238

The correlation of .5310 between intelligence quotients yielded by group tests and marks received by the girls

¹⁵ Kaulfers, W. V., *The Intelligence Factor in Foreign Language Achievement*, *School Review*, 1931, Vol. 39, pp. 42-48.

during the first semester is fairly high. The correlation of .4255 for the boys is moderately substantial. Correlations between intelligence quotients and more valid and reliable measures of achievement, such as scores on objective standardized tests, are likely to be higher and, hence, more reliable as a basis for prognosis and guidance. The lower correlations obtained for the boys indicate that boys are much less likely to work up to capacity in Spanish than are girls. In the fourth semester there is a higher mean intelligence level for both sexes. This is accompanied by a lower correlation for the boys and a higher one for the girls, indicating again that girls, in general, achieve more consistently in accordance with their ability than do boys. In the fifth semester, the same consistency and constancy of achievement by the girls is indicated.

Measurement and diagnosis in the modern languages. There are now available several excellent groups of tests for the modern languages. One, *The American Council Tests*,¹⁶ was developed by the Modern Foreign Language Study. Similar tests have been developed in two forms for Spanish, German, and French. These tests were devised (1) to measure objectively certain important aspects of achievement in ability to read and write the modern language, (2) to make possible an accurate comparison of achievement in different schools and classes using different methods and existing under different conditions, (3) to aid in the classification and placement of pupils, (4) to be used for investigating various factors bearing on achievement, such as age, intelligence, and the like, and (5) to make it possible to define immediate objectives in definite terms.

Another group of tests, the *Columbia Research Bureau*

¹⁶ Published by the World Book Company, Yonkers-on-Hudson, N. Y.

Tests, was prepared under the direction of Dr. Ben D. Wood. These tests were designed to provide colleges and high schools with "more reliable, valid, and comparable measures of achievement than are usually afforded by examinations." These tests are published in two forms. Each form consists of three parts: a vocabulary test, a comprehension test, and a grammar test. The scoring of the tests is objective throughout. The tests are adapted to the whole range of achievement in the first four years in high school and the first three college classes. The reliability of each of the tests in Spanish, French, and German, as a whole, was found to be approximately .96.

New-type tests as well as standardized tests may be used for purposes of diagnosis and remedial work. Such tests aid the teacher in analyzing the situation and in determining the strong and weak points of his teaching. Such an analysis, while it will not always reveal all the causes of pupil success and failure, may suggest the possible causes.

Rogers¹⁷ made a general analysis of reasons why pupils fail. In addition to those factors over which teachers have little control, such as poor mentality, poor health, and the like, he found that there are a number of conditions over which the teacher does have some control. Three causes of pupil failure stood out in his study: a lack of pupil-teacher co-operation, no provision for homogeneous grouping, and little effort at taking care of individual differences in ability and study habits.¹⁸

¹⁷ Rogers, D. C., "A Study of Pupil Failures and Subject Failures in Chicago," *Journal of Educational Research*, 1926, Vol. 14, pp. 247-255.

¹⁸ See also Tharp, J. B., "Sectioning classes in Romance Languages," *Modern Language Journal*, 1927, Vol. 12, pp. 95-114; Grossman, L. M., "Slow Progress Classes in the Modern Languages," *Bulletin on High Points of High Schools of New York*, Sept., 1927; and Corbin, A. L., "Special Promotion for Superior Students," *Modern Language Journal*, 1927, Vol. 12, pp. 115-117.

B. Latin

Psychologists are interested in the aims and objectives stated for any subject because ultimately the question must be raised as to what a study of the subject does to the child; or, to put the matter in other words, how the subject aids the child in his organization and development. Too many teachers, and sometimes good teachers, see the problem of Latin teaching merely as so much work to be covered, so many words to be memorized, and so many lines or passages to be read. The teacher should frequently ask herself what there is in the lesson of the day that aids pupil growth and widens pupil contacts. Indirectly related to the topic of aims are two facts of fundamental importance emphasized in the report of the "Classical Investigation."¹⁹ In the first place, it was shown that pupils study Latin for a comparatively short period of time. The facts as found are summarized in Table XXXIX. An examination of the table shows that the

TABLE XXXIX

PERSISTENCY OF ONE HUNDRED PUPILS BEGINNING A STUDY OF LATIN

<i>Year</i>	<i>Pupils</i>
1.....	100
2.....	65
3.....	31
4.....	14
5.....	5

great majority of pupils study Latin not more than two years. The teacher must keep this fact in mind and organize and teach the subject so as to make each year's work worth while in itself. As was pointed out in the

¹⁹ *Report of the Classical Investigation*, Part I, p. 51, Princeton, Princeton University Press, the American Classical League, 1924.

report of the investigation, a course so organized and taught will furnish a better preparation for advanced work and will likely cause more students to continue the subject because it has been adapted to their interests and abilities.

In the second place, psychological opinion is almost unanimously agreed that transfer is possible but does not occur automatically. This, again, shows the importance of a definite, conscious purpose in the daily work of the class. Latin can be justified in the curriculum only if desirable immediate and ultimate objectives are definitely aimed at. The content of the course and the method of instruction must be selected for their value in the attainment of these objectives.

Values in the study of Latin. The objectives of any subject state the abilities which it is hoped that a study of the subject will develop. Whether these objectives are of value in the life of the individual and the group is a problem which must be solved in the light of our knowledge of the psychology of development and of the current sociological philosophy. In his study of curriculum practices, Glass makes the following statement:

The tendency to abandon Latin which has characterized the administration of the secondary-school program of studies in the past fifteen years should be checked before Latin goes the way of Greek. The English language and twentieth-century civilization owe too much to the Latin language and to Roman civilization to consign Latin to the Educational scrap-heap. There will always be a group of secondary-school pupils whose intelligence quotients prove that they are capable of profiting from Latin courses, whose education will be incomplete without first-hand knowledge of the Latin origin of their own daily speech and the literature of most of the people they will read, and who cannot intelligently interpret present-day social life and modern

civilization without intimate knowledge of Roman life and civilization.²⁰

Our notion of the psychology of the individual is very accurately reflected in the curriculum which we organize for his development. During the early part of the twentieth century, there was a strong reaction in psychological circles against subjective methods, and an open espousal of more objective and quantitative lines of investigation. This movement in psychology was contemporary with the rise of the public high schools and the great influx of students into secondary schools and colleges. At the same time, the sciences and practical arts were under pressure from the rising industrial and economic tide demanding admission into the school.

The psychology of the situation was such that Latin and Greek were vigorously attacked and defended. With little experimentation and with more eloquence than evidence, arguments carrying the weight of authority of great names in the field of psychology were advanced. Now that we are able to get a better perspective of the whole controversy, it is realized that too much was claimed on both sides.

As was previously stated, the worth of a subject is to be determined by how it aids the individual in his development. One of the chief differences between man and the animals and between superior and inferior men seems to lie in their ability to think—using the term in a broad sense. The relation between ideas and language is well known. Some subjects in the school curriculum are important because they furnish a great amount of mental

²⁰ Glass, J. M., "Curriculum Practices in the Junior High School and Grades 5 and 6," *Supplementary Educational Monographs*, 1934, No. 25, p. 92.

content; in other words, they aid the individual in developing a worth-while psychological environment. Latin, it appears, should be especially valuable for those students who have good ability and whose interests lie in ideational lines. For those individuals who do not possess enough ability to develop broad contacts and a broad philosophy of life, Latin is certainly of little value.

Relation between ability in Latin and intelligence. A number of studies seem to show that Latin students, as a rule, are superior to non-Latin students. Starch²¹ seems to interpret the results of his studies and of other studies which he analyzed as indicating that superior gains in spelling and other fields were due to superior intelligence rather than to the transfer of ability gained through a study of Latin. Starch based his analysis partly on a series of psychological tests, such as tests of perception, memory, association, and imagery. He worked on the assumption that the capacities he measured were only slightly, if at all, influenced by language training. This assumption is, of course, open to question. However, Starch found that the pupils who had taken the most languages did the best on the tests and, according to his assumption and interpretation, were superior mentally.

In another study, Otis²² used a different method of approach to the problem. He selected 50 pupils who had studied Latin and an equal number who had not. These pupils were selected on the basis of the grades they had made in school. Each pupil who had studied Latin was matched with one who had not. The *Terman Group Test*

²¹ Starch, Daniel, *Educational Psychology*, New York, The Macmillan Company, 1920, pp. 229-243.

²² Otis, A. S., "The Relation of Latin Study to Ability in English Vocabulary and Composition," *School Review*, 1922, Vol. 30, pp. 45-50.

of *Mental Ability* was then administered to both the Latin and the non-Latin groups. It was found that the Latin students excelled the non-Latin by 16.6 per cent. Otis explains his findings on the assumption that the non-Latin students selected easier courses than did the Latin students and in this way made equal grades.

Thorndike²³ reported several studies in which he used

TABLE XL

PER CENT OF LATIN STUDENTS SURPASSING THE
MEDIAN OF THE NON-LATIN GROUP ON VARIOUS
TESTS OF MENTAL ABILITY. (*After Newcomb.*)

<i>Test</i>	<i>Per Cent</i>
<i>National Intelligence Test</i>	64
<i>Terman Group Test of Mental Ability</i>	63
<i>Otis Group Intelligence Test</i>	71
<i>Illinois Intelligence Examination</i>	48
<i>Haggerty Intelligence Examination</i>	45
<i>Army Group Intelligence Test</i>	55

his *Test of Word Knowledge* once and the *Thorndike-McCall Reading Scale* in the other cases. His results are not very conclusive, although he found that the Latin students made one and one-half times the gains made by the non-Latin students.

A large number of tests were given for the American Classical League and reported by Newcomb.²⁴ Her results are given in terms of the per cent of Latin pupils surpassing the median of the non-Latin, and are shown in Table XL. It will be noticed that the Latin surpassed

²³ Thorndike, E. L., "The Influence of First-Year Latin upon Range of English Vocabulary," *School and Society*, 1923, Vol. 17, pp. 82-84; and "The Influence of First-Year Latin upon Ability to Read English," *School and Society*, 1923, Vol. 17, pp. 165-168.

²⁴ Newcomb, Edith I., "A Comparison of the Latin and non-Latin Group in High School," *Teachers College Record*, 1922, Vol. 23, pp. 412-422.

the non-Latin by a large margin in every case except in the Illinois and the Haggerty intelligence examinations. It is possible that these differences are due to the language factor, since all the tests are largely language tests. However, the weight of the quantitative evidence seems to indicate that Latin pupils as a rule are superior.

The correlation method has been little used in studies of the relation between Latin and mental ability. Flemming²⁵ secured correlations among Latin achievement, measures of intelligence, and several other factors. These are presented in Table XLI. It will be observed that there is a fairly high relationship between Latin and intelligence, and that about the same correlations are found with English and mathematics.

TABLE XLI

COMPARATIVE CORRELATIONS OF OBJECTIVE TESTS OF LATIN AND OF MENTAL ABILITY WITH AVERAGE SCHOOL ACHIEVEMENT AND ACHIEVEMENT IN LATIN AND ENGLISH. (*After Flemming.*)

Variable (with)	Correlation Test				
	Terman Group Mental Test	Estimate of Intelli- gence	Average Achieve- ment	Latin Achieve- ment	Chrono- logical Age
<i>Latin Achievement</i>.....	.3899	.4845	.7982	—	.083
<i>Ullman-Kirby Compre- hension Test in Latin</i> ..	.6698	.6653	.6916	.6300	.4401
<i>Godsey Construction</i>.....	.2850	.4845	.6808	.5960	.0972
<i>Godsey Rules</i>.....	.5909	.6236	.6539	.3768	.3567
<i>English Achievement</i>.....	.5640	.6653	.6739	—	.0384
<i>Mathematics Achievement</i>	.5832	.6236	.5775	—	.0570
<i>Average Achievement</i> ..	.6339	.7045	—	.7892	.3019
<i>Terman</i>	—	.6786	.6339	.3899	.4341
<i>Teachers' Estimate of In- telligence</i>.....	.6786	—	.7045	.4845	.4679

²⁵ Flemming, Cecile W., "A Detailed Analysis of Achievement in the High School," *Contributions to Education*, Columbia University, Teachers College, 1925, No. 196, p. 122.

Psychological factors involved in learning Latin. The methods used in the learning of Latin are quite different from those used by the individual in acquiring his native language. In the latter case, as the individual, through experience, developed meanings for the situations with which he came in contact, he secured words and other language units which stood for those experiences and situations from his social group. This is to say, the vernacular is related genetically to experience in a way that Latin almost never becomes related to it. The individual may substitute the Latin for the vernacular later, but it seldom, if ever, becomes so definite a part of his reaction system.

If the child of English-speaking parents were to come in daily contact with individuals speaking Latin, there is no reason why he would not learn Latin as readily as English. Probably, under favorable conditions, he would develop two language habit systems. Under ordinary circumstances, however, English is learned early in life and the movements which produce words become definitely habituated, so that it is difficult later to learn to speak or read a different language with correct pronunciation. Latin contains phonetic elements different from those occurring in English. Thus, new movements and controls must be learned, and it is difficult for the student.

Another psychological factor involved in learning Latin is the fact that Latin word order is different from the word order of the vernacular. In his native tongue, the pupil has learned to grasp the significance of the words in certain arrangements; and he accordingly secures meaning from large language units as a whole. In Latin, the meaning of a word is not so readily secured from the context. Here the thought of the sentence is determined

more by the form of the different words and less by their arrangement than is the case in English. In addition, it is exceedingly difficult to think of the meaning of the Latin word except by using its English equivalent. For this reason it takes considerable training to develop the ability to run through Latin sentences holding the meaning in mind as one goes along, since two different sets of symbols are involved.

Meanings, thought, are usually if not always in terms of language. Many Latin teachers hold that one objective of Latin is to develop the ability to secure the meaning of a Latin sentence directly. There is considerable doubt as to whether the great majority of Latin pupils would ever be able to get the meaning directly from the Latin, that is, without using their native language as an intermediary.

A fundamental principle of the psychology of learning is that methods of teaching should make full use of the past experiences of the pupil. The experiences which may be utilized in the teaching of Latin are chiefly secondary; that is, they are secured through history, English, pictures, and the like. In order to utilize such experiences to the fullest, the teacher must have broad contacts with and must know the curriculum content of the school.

There is a very definite tendency among Latin teachers today to place the functional aspects of the subject first. The ability to get the thought from a Latin sentence or paragraph is made the dominating motive in studying Latin. There is little that can be said for extended drills on new forms, principles of syntax, and words. These should be introduced at the appropriate time and place in the context. When a need arises, or when some inter-

esting turn of the thought depends on a new principle of syntax or form, that is the appropriate time for calling attention to it. In English we do not develop a consciousness of the forms we use; but in Latin there is a greater need for such consciousness.

Motivation and interest in Latin. Owing to its nature, Latin is one of the hardest subjects to motivate. As a rule, motivation is easier in those subjects in which large activities may be used for developing interest. In Latin there are, however, certain activities which may be used as a part of the work and which serve as motivating factors. Problems dealing with maps, models, plays, and the like, involving less of the abstract, are examples.

In a study of the content and methods of high-school Latin, Grise²⁶ administered a questionnaire, on which pupils gave the following motives for continuing Latin, in order: college entrance requirements, the value of Latin for English, the belief in the value of Latin for mental training, the belief in the value of pursuing a subject for a long period of time, a liking for the subject, and a number of minor reasons. Fenton²⁷ used what he called a "visual method" with one group and the conventional method with another for the purpose of comparison. In the first group, he showed pictures and sentences on a screen and had the pupils study them. The "visual method" was found to be superior in both immediate and delayed recall. Fenton really seems to have found a means of motivation and interest.

Pupils usually enter upon the study of Latin with much

²⁶ Grise, F. C., "Content and Method in High-School Latin from the Viewpoint of Pupils and of Teachers," *Contributions to Education*, George Peabody College for Teachers, 1925, No. 19.

²⁷ Fenton, Norman, "An Experimental Study of a Visual Method in Latin Instruction," *School Review*, 1928, Vol. 36, pp. 675-678.

zeal and interest. Teachers have been so zealous in emphasizing forms and syntax that they have lost sight of the interests of the pupils and the real purpose of the study of Latin. As a result, only those pupils of superior ability who were able to master the assignments could maintain an interest in the subject. Concerning the reorganized course as outlined by the "Classical Investigation" and the problem of motivating the Latin work, the following thought is presented:

The course appeals to the interest of the learner by an early introduction of Latin stories, and by emphasis on the comprehension of thought, the cultural background, and the values of Latin for English; furthermore it affords the beginner a sense of progress by the more gradual introduction of the difficulties of form and syntax.

Opportunity is afforded in the Latin Course of Study for specific correlation with related subject fields, particularly with English, the social studies, and the modern foreign languages in the materials used for attaining the ultimate objectives. The study of technical terms of Latin origin extends contacts also to most of the other high-school studies. Projects, construction of realia, and the various extra-curriculum activities, such as plays and pageants, may enlist the co-operation of many departments, namely, art, music, speech, home economics, physical education, and manual arts.²⁸

Latin and English. Attention has been called by a number of writers to the poor quality of English used in classroom translations. One of the aims of the "Classical Investigation"²⁹ is related to "increased ability to speak and write correct and effective English through training in adequate translation."

In a study of the quality of English used in Latin trans-

²⁸ "Instruction in Foreign Languages," *Bulletin*, United States Department of the Interior, Office of Education, 1932, No. 17, p. 39.

²⁹ *Op. cit.*, p. 45.

lations, Woodring³⁰ found that correct and effective English is not used in a very large percentage of the translations written by the high-school graduate who has had four years of Latin and who desires to go to college. With respect to her findings, she states:

If Latin is to function in the improvement of English of those students studying Latin, the conditions found in this study must be remedied. More systematic provision should be made for careful criticism and revision of the translations presented by pupils, and only that English which is structurally and idiomatically correct should be accepted by teachers of Latin. If the Latin program is too crowded for such criticism and revision of translations, then less content and better form should be agreed upon. "Automatic realization of the values implicit in Latin cannot be counted on to any large extent. The time must be found for the introduction of appropriate material and the use of appropriate methods in order to secure the satisfactory attainment of any of the ultimate objectives of Latin." (⁸ *Classical Investigation Report*, Part I, p. 100.) If this cannot be done, then Latin cannot justify the time it is consuming in the high-school program.³¹

A study of the value of repeated translations was undertaken by Crider,³² who had pupils translate Spanish a number of times. He found that the translations did not improve, and suggests that there are meanings in foreign language units which first-year pupils can only approach. If his findings are correct, it would seem that final translations should be made under the guidance of the teacher, or that oral translations should be worked out and then put into final form. If meaning is to be attained, both the

³⁰ Woodring, Maxie N., "A Study of the Quality of English in Latin Translations," *Contributions to Education*, Columbia University, Teachers College, 1925, No. 187.

³¹ *Ibid.*, p. 76.

³² Crider, Blake, "The Corrective Value of Repeated Translations," *School Review*, 1929, Vol. 37, pp. 771-779.

translation from the Latin and the expression in English are vital factors.

Vocabulary development. In the consideration of Latin vocabulary, two groups of problems arise. The first is related to methods of acquiring a Latin vocabulary of sufficient size and functional value for reading Latin. The second is related to improvement in English vocabulary and spelling as a result of Latin study. These two groups meet in the common problem of selecting words and devising teaching methods which will meet three conditions: (1) be of maximum value in reading connected Latin, (2) have large functional significance in increasing English vocabulary, and (3) be words whose English derivatives pupils should learn to spell.

With regard to the first group of problems, the "Classical Investigation"³³ recommends that new words should first be met in context and that pupils should be trained to get the meaning of new words so far as possible through the use of the context and through the use of related Latin words and English derivatives.

There seems to be quite a general agreement that about 500 well-selected words should be mastered each year. When the provisions in the various Latin texts for learning the vocabulary are examined, a wide range of practice is found. Tyler³⁴ studied the fifty words of the *Henmon Latin Tests, Form A*,³⁵ for their occurrence in eight of the better-known beginning textbooks. Little uniformity was found in the books in the provision for drill, and it was also found that in individual texts there were not

³³ *Op. cit.*, p. 206.

³⁴ Tyler, Caroline, "A Study of Vocabulary in Beginning Textbooks," *Educational Research Bulletin*, 1926, Vol. V, pp. 285-292.

³⁵ Published by the World Book Company, Yonkers-on-Hudson, N. Y.

proper provisions for drill. Some words appeared to be over-drilled while others were evidently neglected. The ranges in frequency for certain words are shown below.

	<i>Range</i>
<i>bellum</i>	26 to 160
<i>facio</i>	50 to 225
<i>hic</i>	48 to 173
<i>servus</i>	14 to 127
<i>miles</i>	21 to 162

With regard to the situation found in the eight books, Tyler says:

We consider the lack of attention in proportioning a vocabulary a very serious and unnecessary troublemaker for the teachers and pupils who are to use the texts.

In general it is good doctrine that all new bonds, new words, should be strengthened by frequent recurrences at the time of learning and that as the bonds grow older and stronger the number of practices may diminish and re-occur at longer intervals.³⁶

There are a number of word lists available, but we know very little as to the value or difficulty of any individual word. However, words selected for mastery should be thoroughly studied and repeatedly drilled upon. Frequent vocabulary tests should be used for inventory and diagnostic purposes.

The functional value of a study of Latin in increasing the English vocabulary has been studied by a number of workers. Thorndike³⁷ reported a study that he had conducted for the "Classical Investigation." In his report he compares the gains made by certain Latin and non-Latin

³⁶ *Op. cit.*, p. 292.

³⁷ Thorndike, E. L., "The Gains Made in Ability in English by Pupils Who Study Latin and by Pupils Who Do Not," *School and Society*, 1923, Vol. 18, p. 690.

students on the *Thorndike Test of Word Knowledge*.³⁸ His results are summarized in Table XLII.

TABLE XLII

COMPARISON OF GAINS MADE BY CERTAIN LATIN AND NON-LATIN STUDENTS. (*After Thorndike.*)

(1)	Gains		Superiority of Latins (4)
	Latins (2)	Non-Latins (3)	
After 2 years.....	5.2	5.8	-.60
After 1 year:			
Two-year group.....	3.5	2.4	.10
One-year group.....	3.78	3.04	.74
After one-half year:			
Two-year group.....	1.8	1.4	.40
One-half-year group.....	1.33	1.39	-.06

The results of the Philadelphia experiment as reported by Haskell³⁹ and Hamblen⁴⁰ and summarized by Symonds and Penney⁴¹ are given in Table XLIII.

The material presented by the experiments conducted by Thorndike, Haskell, Hamblen, and others, was combined by Symonds and Penney with results secured in an experiment with fifteen ninth-grade girls. These pupils were given special instruction in vocabulary over a period of four months. They were tested for word knowledge

³⁸ Published by Teachers College, Columbia University.

³⁹ Haskell, R. I., "A Statistical Study of the Comparative Results produced by Teaching Derivation in the Ninth-Grade Latin Classroom and in the Ninth-Grade English Classroom to Non-Latin Pupils," unpublished Ph. D. dissertation, University of Pennsylvania, 1924.

⁴⁰ Hamblen, A. A., "A Statistical Study to Determine the Amount of Automatic Transfer from a Study of Latin to a Knowledge of English Derivatives, and to Determine the Extent to which this Amount may be Increased by Conscious Adaptation of Content and Method to the Allowment of this Objective," unpublished Ph. D. dissertation, University of Pennsylvania, 1924.

⁴¹ Symonds, P. M., and Penney, Edith M., "The Increasing of English Vocabulary in the English Class," *Journal of Educational Research*, 1927, Vol. 15, pp. 93-103.

both before and after the experiment. It was found that the experimental group of Latin students had improved more than three times as much as the control. The gain was found to be greater than that made by a group that had studied Latin for two years, as reported by Thorn-

TABLE XLIII

GAINS IN LATIN AND NON-LATIN CLASSES IN PHILADELPHIA

(1)	<i>First Semester</i> (2)	<i>Second Semester</i> (3)	<i>Year</i> (4)
Non-Latin:			
Control group.....	3.12	—	6.04
Experimental group.....	6.0	—	8.5
Latin:			
Control group.....	5.15	1.69	6.74
Experimental group.....	6.53	3.66	10.67

dike, and also greater than that made by the group reported on by Haskell and Hamblen and to which special instruction on derivatives had been given for a semester.

The results of studies relating to the influence of Latin on English vocabulary are not in agreement. In general, the study of Latin derivatives appears to have an appreciable effect on the development of English vocabulary. The methods suggested in the report of the "Classical Investigation" for developing English vocabulary through a study of Latin words are as follows:

Encouraging pupils to discover independently new derivatives from Latin words already learned.

Encouraging pupils to discover in their English reading derivatives discussed in class.

Asking pupils to discover independently new derivatives from Latin words specially assigned.

Encouraging pupils to use in sentences derivatives discussed in class.

Definite assignment of English derivatives for explanation on the basis of their etymology.⁴²

⁴² *Op. cit.*, p. 212.

The situation with respect to the value of a study of Latin for the spelling of English words is also confusing. Usually, a small superiority has been found in favor of those pupils who have studied Latin. Coxe⁴³ probably made the most carefully controlled experimental study. He studied Latin and non-Latin pupils to determine whether the study of Latin influences the learning of English words derived from Latin which had been previously studied. In the study, spelling and intelligence were kept constant through the use of comparable groups. The results show that a study of Latin does help English spelling where the words are of Latin derivation. He found that where the words are of non-Latin origin, there is a slight tendency for the study of Latin to interfere with such words. This interference seems to be greatest where attempts are made to point out similarities between the spelling of the two languages. When the principles governing the spelling of Latin derivatives are given specifically with the word and not in general, there seems to be no interference.

Transfer and Latin. There are a number of opinions regarding the transfer of training. There are those who hold that learning is specific and that only identical elements transfer from one situation to another. Others hold that the individual tends to generalize his experience and that general aims, purposes, and habits transfer. There are still others who hold to the notion that there is very little transfer in any form.

The experimental literature seems to bear out the idea that there is transfer of training, and the opinions of most psychologists seem to be in agreement with the scientific

⁴³ Coxe, W. W., "The Influence of Latin on the Spelling of English Words," *Journal of Educational Research Monographs*, No. 7, 1925.

findings. The report of the "Classical Investigation" regarding transfer was based on a list of questions submitted to a large number of psychologists. The main paragraphs of this report as they affect Latin teaching are:

1. Automatic transfer is a function of the intelligence of the pupil and comparatively few young pupils possess capacity for independent generalization in a sufficient degree to justify the adoption of methods of teaching Latin which assume the occurrence of automatic transfer to a large extent. The less we assume automaticity of spread and the more we work for it, the more certain we will be that our procedure is correct. All experiments in transfer tend to show that transfer is automatic only when applications are so nearly identical that they are a matter of course.

2. For the great majority of pupils studying Latin the development of the habit of generalization and consequent transfer calls for continued practice in it by teacher and pupil.

3. When a particular habit, trait or aim has been generalized and has been repeatedly applied to other fields, it may be expected to become automatic.⁴⁴

Tests for measuring the results of Latin instruction. Standardized Latin tests serve the teacher in two ways. First, tests may be used to measure the efficiency of instruction, that is, to determine whether the objectives set forth for Latin are being attained. Thus, the aim of Latin should be constantly in mind in the development of the testing program. In the second place, tests may be used for diagnostic purposes. In this case, the teacher should not rely on standardized tests alone but should use a variety of new-type tests.⁴⁵

There are a large number of well-constructed Latin tests available, but space will not permit a discussion of

⁴⁴ *Op. cit.*, pp. 55-62 and 183-188.

⁴⁵ See Chapter XIX for a discussion of the new-type tests.

these here. The "Classical Investigation" gave a decided emphasis to the construction of standardized tests in the field of Latin.

Thought Problems

1. Trace the reasons for which the modern languages have been studied at different periods. Select some small high school and answer the following questions with reference to it: Should a modern language be included in the curriculum? If so, what class or group of students should study it? Which language should be offered? Why should this language be offered rather than some other?

2. If only one foreign language can be offered, should it be Latin or a modern language? Why?

3. Outline a procedure for motivating modern language study.

4. What is the function of grammar? Can you list three values secured from a study of grammar?

5. Construct a new-type test for one of the modern languages.

6. List the values derived from a study of Latin in what you think is the order of their importance. What is meant by "the cumulative value of Latin"?

7. Do you think that the studies support the notion that Latin students are on the average superior? Do you think that Latin students are superior because they have studied Latin or because they have inherited good ability to learn?

8. Work out a concrete statement as to what is meant by transfer of training. In what ways do you think a study of Latin helps pupils in other fields? Does the value of Latin depend on whether its benefits are or are not transferred?

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CHAPTER XIII

Psychology of Mathematics

Abstraction versus concreteness. Too often an exceedingly good student in mathematics does not make a good teacher of mathematics. It is very frequently found that the mathematician enjoys deriving the nature of algebra from the definitions and discussions of its fundamental laws, that he makes rigorous deductions, and that he considers the subject an abstract system of symbols which exists in a perfect unity so far as logic is to be found. This formal view presented to the student new in the field of algebra detaches the subject from the student's world of experience and makes it one of formalisms hovering in an unconnected manner in the student's memory. It tends to make the content of mathematics meaningless and the procedure involved in acquiring this content one of pure memory exercises.

Another factor responsible for the formalism so often found in algebra and geometry is that of treating arithmetic, algebra, and geometry as three different, wholly unrelated subjects. In content and method of work, these cannot be wholly isolated and still be related to life experiences. The general thought of relating mathematics materials to life experiences is as essential as is the case for any other materials. Mathematical symbols and formulas detached from significant life problems make

mathematics materials formal and well-nigh meaningless to the average high-school pupil.

Abstraction is a form of mental activity which begins with analysis. It is a developing process, and is dependent upon a knowledge of ordinary experiences systematized and correlated. It represents the ability to go beyond actual, present experiences and to formulate principles from the generalizations brought forth. It involves symbols, and in algebra various symbols are introduced. Habits of the language type pertaining to these symbols must be built up. Manipulation, interpretation, and perception of relations must precede abstraction if it is to be understood by the pupil.

Motivation of mathematics. The exploration of a student's aptitude for mathematics and the development in the student of an interest in mathematics are vitally important. It is quite essential for the instructor of mathematics to be enthusiastically interested in mathematics work and to recognize the relation of this work to the world about him. If the teacher recognizes this relation, numbers, geometrical figures and proportions, and algebraic formulas will be more than so much material that must be learned in some organized manner. The algebraic formula becomes a symbolic means of expressing a worthwhile and meaningful relation, the geometric figure becomes a means of expressing relations present in art, architecture, engineering, and industry. Symmetry presented in mathematics becomes, thus, an important principle in designs and in the operation of nature, rather than a formal definition or drawing in a textbook.

Applying the spirit of modern developments in psychology to the laws of learning in high-school mathematics, one finds a technique grounded on the understand-

ing of mathematics as a related study rather than organized in small, unrelated doses to be handed out by the teacher. The learning process is a result of activity, rather than a passive process. As an aid to the motivation of such activity, the subject matter should be organized with reference to the learner rather than to the topics themselves. The motivation should be of such a nature that the high-school student will have repeated opportunities to realize the intrinsic worth of mathematics as an interpreter of his environment and as a contributor to his more efficient functioning as a member of a civilized social order. "But no program of motivation, however elaborate, will bear the fruit of an enlightened interest on the part of the pupils if it is grafted upon the dead stump of the instruction imparted by a poorly prepared and non-enthusiastic teacher."¹

Some difficulties encountered in mathematics. A survey of the difficulties encountered in the mathematics work will reveal one or more prominent elements. Probably the greatest difficulty is due to *general confusion*. General confusion grows out of several stages of temporary confusion. The difficulty in this case is that the student has not mastered the fundamental technique; therefore, when problems which demand a knowledge of the unmastered technique are met, there is a stage of temporary confusion. Mathematics is a continuous subject, in which one bit of experience is directly related to the next. In this study, an almost perfect hierarchy of habits is established, and if some of these are not well developed, the process of integrating further habits will be very dif-

¹ Wren, F. L., "Motivation of Mathematics in Junior High School," *The Peabody Reflector and Alumni News*, June, 1934, pp. 221-223 and 266.

ficult. A second cause of difficulty in mathematics is *inability to deal with abstractions*. Surveys have shown that students inferior in intelligence cannot successfully carry on the work required in high-school mathematics. The principles involved in this form of imagination reach out beyond one's concrete experiences and begin to be symbolic in nature and universal in application. Inability to deal with abstraction is usually due to inferior mental ability but in some cases may be due to poor habits of thinking or to very restricted associations. A third causative factor which enters in at all stages of the growth of ability in mathematics is *carelessness*. Under this will naturally fall a number of habits of work. The student copies down the wrong sign or fails to notice some important phrase in the interpretation of the problem; poor attentive processes are present and the student doesn't grasp the directions and procedure; other similar types of behavior would be classed here. A fourth cause of inability in abstraction is the *difficulty of application*. This phase of difficulty has already been discussed in another connection. In this case, the trouble usually lies in the formal method of teaching isolated principles and is found, for example, in a pupil's inability to apply his knowledge of mathematics to the problems of physics, and the like. A fifth cause is *deficiency in comprehension*. The student must be able to comprehend the problem situation. He must recognize the meaning of the problem and be able to sense the various relationships expressed in the situation.

A. Algebra

Algebra is a mathematical science. All the mathematical sciences are, more or less, forms of abstract thinking. Algebra is especially to be so classed. The term

algebra was used at least as early as the ninth century, and the subject had served many purposes for centuries prior to that time. Algebra has always been a science of numbers, regardless of the phases of the subject which have received special emphasis. In algebra, concrete experiences of life are reduced to formulas, expressed in letters and signs. From these generalizations, the laws of mathematical combinations are worked out. It is in this manner that computations are reduced to a less cumbersome and more economical method. From this we see that algebra comes to be a rather formal subject, full of abstract generalizations, and in reality the A B C of higher mathematics. The collected knowledge of the findings of the race in the line of "pure numbers" is, thus, compiled for us in the form of our algebra text. It is this knowledge, which it has taken the race many generations to discover, that we attempt to teach the child in the space of a few years.

The pupil on entering high school is supposed to have a fairly workable knowledge of arithmetic. It is upon this foundation that the approach to algebra is made. "Algebra is a generalized arithmetic, and as such is related historically to the science of number rather than to the science of space."² Perhaps the closest point of contact between the two comes in the use of formulas. The pupil in his arithmetic work has had experience with formulas for percentage, areas of figures, and volumes of some few figures. From the study of these formulas, the pupil can be led to see that the letters used in algebra are symbols stripped of all concrete content, and that with these the laws of mathematical operations are learned.

² Judd, C. H., *Psychology of High School Subjects*, Boston, Ginn and Company, 1915, p. 90.

Objectives in the study of algebra. As the individual goes through life, he is faced with the constant necessity of adjusting himself to a physical environment. As these adjustments are made, meanings are developed and further reactions are conditioned by them. By the time the individual has reached the high school, much of his environment consists of meanings and relations which have grown out of his reactions to the physical world. Symbols are used to denote the meanings and relations which constitute the psychological environment. Algebra may be thought of as an advanced form of language which enables one to name and discover relations and functions. It must be conceived throughout as an instrument which may be used as a means and not as an end in itself.

It is rather difficult to state the objectives of algebra in terms of pupil abilities without defining these in terms of algebraic abilities. Mills and Mills state:

The function of the study of algebra is to give facility in abstract or symbolized thinking. Its business is to afford the pupil experience in algebraic processes, which means experience in analytic-synthetic processes of thought with reference to an abstract universal subject matter. In terms of pedagogical values, the aim is to habituate the pupil to the method of thought involved in algebraic processes, to raise him above the level of one-dimensional thinking, to free him from bondage to the here and the now, and from bondage to things—to universalize his mind.³

Stated in another way, we may consider the function of algebra teaching as that of aiding the pupil to develop the ability to analyze a problem, to formulate it quantitatively, and to interpret it. The primary purposes of instruc-

³ From *The Teaching of High School Subjects*, by Mills, Wm. A. and Harriet H., pp. 239-240. Used by permission of D. Appleton-Century Company.

tion in mathematics were presented some time ago as follows:

The primary purposes of the teaching of mathematics should be to develop those powers of understanding and of analyzing relations of quantity and of space which are necessary to an insight into and control over our environment and to an appreciation of the progress of civilization in its various aspects, and to develop those habits of thought and of action which will make these powers effective in the life of the individual.⁴

Interests in algebra. If teachers know what factors in a subject pupils like or dislike, and if they are aware of methods of building up interests in it, they have a decided advantage in teaching the subject. Algebra is an abstract subject and one which provides for very little manipulative activity of a grosser type. Thinking in abstract terms is very difficult for most pupils and is not easily motivated.

Two principles of motivation are worthy of special mention. In the first place, an active search should be made of the points at which algebra touches the experiences of the pupils. Teachers generally know too little about the background of their pupils. There are many problems in which pupils are interested and in the solution of which a knowledge of algebra would be of advantage. In the second place, pupils are interested in mastering a subject and in knowing definitely that they are mastering it. Pupils should and have a right to know how they are progressing, for knowledge of results is a powerful factor in motivating learning. Standardized and new-type tests are two kinds of tests that may be used for inventory and stock-taking purposes.

⁴Report, "The Reorganization of Mathematics in Secondary Education," *The National Committee on Mathematical Requirements*, 1923, pp. 10-11.

The teacher must know how to take advantage of opportunities for arousing interests. Generally, at the beginning of the year pupils are glad to get back to school. If they found school dull at the end of the previous year, enough time has elapsed for this feeling to have faded out, and they are likely to have a pleasant anticipation as they resume their work in the fall. At the beginning of the new term, pupils have a willingness to throw themselves into schoolwork and acquire new points of view. There are so many new factors—children, teachers, books, and classrooms—that the novelty of the situation appeals to them. Every advantage should be taken of this situation so that a favorable attitude toward algebra may be secured from the very beginning.

Only a few experimental studies of children's interests in algebra have been made. Schorling, Kahler, and Miller⁵ reported the votes of pupils in several Chicago schools as to whether they enjoyed their studies "very much," "a little," or "not at all." The results showed mathematics well below the average, ranking seventh in a list of ten subjects. Thorndike⁶ studied the interests of pupils in algebra in comparison with other school subjects. He found algebra standing at about the median when the subjects were ranked by a rather complicated process from the one liked best to the one liked least.

As a further feature of his study, Thorndike prepared a series of samples of some of the things which children are supposed to learn to do in algebra. These he had children mark as to whether they liked the type of work most, next

⁵ Schorling, R., Kahler, F. A., and Miller, O. M., "The Place of Mathematics in the Secondary Schools of Tomorrow," *School Science and Mathematics*, 1916, Vol. 16, pp. 608-616.

⁶ Thorndike, E. L., *Psychology of Algebra*, New York, The Macmillan Company, 1924.

most, least, or next least. From his study, the following conclusions are drawn:

1. There is no evidence that pupils prefer applied problems to computation.
2. There is abundant evidence supporting the common belief that numerical computation is better liked than literal computation.
3. Fractions have in general the same prejudicial influence that literal numbers have.
4. There is evidence that elaborate simplifications are notably disliked.
5. The work in evaluation by substituting numerical values for several variables seems to be attractive to pupils in spite of the fact that most courses in algebra pay relatively little attention to it and that most pupils do such work badly.
6. The graphing of equation-lines is by no means as dreary an exercise as the mathematician thinks, or as it may well be to the mathematically gifted.
7. Difficulty is disliked, ease being especially liked where a little thought or work seems to produce a considerable result.⁷

Developing algebraic notions. There is not a great deal in algebra as it is usually organized which can be linked in a very definite way with the previous experiences of the pupil. Even a considerable part of the language of algebra is new to the pupils, and much of it that seems familiar may have different meanings in its connection with algebra.

The language of algebra is, as is true with all the school subjects, somewhat different. This is what would be expected in any new field. New technical terms must be learned; but, unless necessary, a large number of new words should not be introduced. Algebra is an abstract subject and difficult at best without the additional burden

⁷ *Ibid.*, pp. 408-409.

imposed by a strange terminology. Pressey⁸ found a total of 267 words which she classified as technical used in the study of algebra. Thorndike⁹ examined the first fifty pages of three standard textbooks for first-year algebra and found many words that are undoubtedly not essential, that is, words which could be replaced by simpler expressions without violence being done to the desired meaning. However, after due allowance is made for unnecessary technical words, there are still many that are technical to be mastered. Mathematical meanings can be expressed only through the use of language. The teacher of algebra, then, has the task of developing meanings for words and symbols. From the psychology of habit formation, we know that meanings arise from experience and become attached to symbols used in connection with that experience.

There are two ways of developing meanings in teaching algebra. The first is to state a rule or principle and then illustrate it through a number of typical examples. The assumption here is that a statement is to be made and then meanings are to be built up from the statement. Unfortunately, pupils rarely go back to the rule or principle after the illustrations are read but go directly on to the problems, attempting to work them by the same methods used in the illustration. Thus, under this method, the general concept is never completely clarified.

Meanings are learned in actual situations in algebra as they are elsewhere in life. Rules and principles should grow out of actual experiences. Since the pupil has had few experiences from which meanings in algebra may be

⁸ Pressey, L. C., "Determination of the Technical Vocabulary of School Subjects," *School and Society*, 1924, Vol. 20, pp. 91-96.

⁹ Thorndike, E. L., *op. cit.*, p. 261.

secured, it is necessary that he be given such experiences. A psychologically sound procedure would seem to demand that rules and principles be formulated as generalizations only after considerable time has been devoted to the use of the principles.

Transfer value. The problem of transfer is of especial importance, since it bears on curriculum construction and high-school requirements. Even though the average high-school student will never navigate a ship, direct the fire of artillery, or build electrical transmission lines, it seems reasonable that problems connected with real situations might have as great, if not greater, educative value than those which have no basis in the affairs of civilization. Problems which are purely fictitious can have little disciplinary value for the simple reason that they have few points of contact with situations that are met in life. Since such problems have few contacts, there is little that can be carried over from them to other situations. Problems based on life situations, even though the pupil never actually meets the individual circumstances, may be of value in providing a basis for understanding the work of the world and for a sympathetic appreciation of others.

There are many real problems in life in which algebraic abilities may be used to give the pupil a clearer and richer insight into the methods of teaching in which applications and generalizations are made and into the principles of study in which guidance and direction in the understanding of materials will have a beneficial transfer effect. One of the aims of mathematical instruction has been stated as:

4. The ability to understand and interpret correctly *graphic representations* of various kinds, such as nowadays abound in popular discussions of current scientific, social,

industrial, and political problems, will also be recognized as one of the necessary aims in the education of every individual. This applies to the representation of statistical data which are becoming increasingly important in the consideration of our daily problems, as well as to the representation and understanding of various sorts of dependence of one variable quantity upon another.¹⁰

Learning difficulties in algebra. Algebra is not an easy subject for most pupils. In one study¹¹ it was found that algebra tied with German for ninth place in preference. It has been found that the percentage of failures in algebra is high. Many causes are ascribed for this fact, many of which do contribute to the difficulty of the subject. Judd¹² points out that there are a great many possibilities of error simply because the subject is extremely abstract. Moreover, it is difficult to check the operations in algebra; the only possible method is reversing the process.

The chief difficulty in the study of algebra arises from the fact that pupils cannot read the language of the subject understandingly. As previously stated, this is owing to the technical vocabulary involved. Teachers of algebra should recognize the language problems involved in the subject. Miss Conoly¹³ found that 21 per cent of all errors analyzed in her study were due to erroneous statements of the problem; that is, they were errors in translating the English of the problem into the symbolism of algebra.

¹⁰ Report, "The Reorganization of Mathematics in Secondary Education," *The National Committee on Mathematical Requirements*, 1923, p. 7.

¹¹ Terman, L. M., *Genetic Studies of Genius*, Palo Alto, Cal., The Stanford University Press, 1925, Vol. I, p. 587.

¹² Judd, C. H., *op. cit.*, p. 92.

¹³ Conoly, Mary MacLean, "A Study of Some Difficulties in High School Algebra," master's thesis, George Peabody College for Teachers, 1924.

In their study of vocabulary, Pressey, Pressey, and Narragon¹⁴ claim that mastery of subject matter is impossible "without those words that express the central core of concepts around which algebraic skills and understandings are developed." Solution of verbal problems is a source of difficulty, according to George E. Hawkins.¹⁵ The process involves reading for understanding, analysis of relationships, translation of the ideas into algebraic symbols, and formation of the required equations. A first-year junior-high-school mathematics class was examined by J. S. Georges¹⁶ for reading difficulties. Mathematical vocabulary caused 23.4 per cent of all the difficulties, while symbols and notations caused 18.8 per cent. The other types of difficulty were: lack of apperceptive mass, causing weakness in interpretation, inability to comprehend meaning fully, and inability to analyze. Vocabulary tests were given by L. C. Pressey and W. S. Moore¹⁷ to grades from the seventh to the twelfth inclusive. All of the pupils had received instruction in arithmetic and practically all had had some in algebra, but only a small proportion had studied geometry. According to the writers, "Inadequate mastery of fundamental terminology is one of the most important reasons for the difficulty encountered by so many persons of all ages and social strata in dealing with anything of a mathematical nature."

Two classes which had had a third of the year's work in

¹⁴ Pressey, Pressey, and Narragon, "Essential Vocabulary in Algebra," *School Science and Mathematics*, 1932, Vol. 32, pp. 672-674.

¹⁵ Hawkins, George E., "Teaching Verbal Problems," *School Science and Mathematics*, 1932, Vol. 32, pp. 655-660.

¹⁶ Georges, J. S., "Nature of Difficulties Encountered in Reading Mathematics," *The School Review*, 1929, Vol. 37, pp. 217-226.

¹⁷ Pressey, L. C., and Moore, W. S., "The Growth of Mathematical Vocabulary from the Third Grade through High School," *School Review*, 1932, Vol. 40, pp. 449-454.

college algebra and approximately two and a half semesters' preparation in high-school algebra were given the *Hotz Algebra Scales*. Arnold¹⁸ found the errors mainly functional: inability to state the equations necessary for verbal problems, to use algebraic symbols for relationships, and to interpret simple graphs.

Confusions, probably due to the fault of the teacher, contribute to failures, according to D. D. Durrell. He says, "If confusion produced by errors leads to mental blocking, additional confusion, discouragement, withdrawal of attention, or a meaningless activity often induced by fear of failure or ridicule, the child often stays on the learning plateau a long time."¹⁹

It appears, therefore, that the two main types of difficulties in algebra may be roughly classified as those that relate to the fundamental skills and concepts and those that are concerned with verbal problems. In the various studies of the learning of algebra, the difficulties of the latter group appear to be closely associated with the abstract and difficult types of thinking necessary for the understanding and solution of verbal problems. These studies point rather specifically to lack of knowledge of the fundamentals, carelessness, confusion in meaning, lack of insight, and other characteristics of pupils, as important obstacles to learning algebra.

Drill in algebra. Teachers generally argue that a certain amount of drill should be given in any subject. There is no topic, however, in which there is less agreement as to the specific details involved than drill in alge-

¹⁸ Arnold, H. J., "Abilities and Disabilities of College Students in Elementary Algebra," *Journal of Educational Research*, 1931, Vol. 23, pp. 324-329.

¹⁹ Durrell, D. D., "Confusion in Learning," *Education*, 1932, Vol. 52, pp. 330-333.

bra. Drill must never be conceived as an end. It has no educative value in itself. However, skill in algebraic manipulation is important, and such skill can be attained only through a certain amount of drill. The following is given as a guiding principle: "*Drill in algebraic manipulation should be limited to those processes and to the degree of complexity required for a thorough understanding of principles and for probable applications either in common life or in subsequent courses which a substantial proportion of the pupils will take.*"²⁰

There are many problems connected with drill in algebra about which we know practically nothing. In the first place, we do not know just what skills should be mastered. Furthermore, no one at present knows the relative difficulty of the various skills that we may select for development. The general principles of distributed practice undoubtedly hold in algebra, but when we attempt to apply them we are at a loss to know how drills should be spaced and the amount of time which should be given to each period.

Because of the lack of definite experimentation in the field, only applications of general principles may be made here. In general, it may be said that the unit to be mastered should be small enough so that sufficient drill may be given to establish the skill fairly well at the first drill period. Decreasing amounts at less frequent intervals should follow until the skill is thoroughly mastered. Too much learning may be detrimental. It may be not only wasteful of time but positively harmful in that children lose interest and develop habits of inattention.

Drills, as they have been organized in mathematics in

²⁰ Report, *op. cit.*, p. 11.

the past, have been too mechanical, being based on Thorndike's so-called laws of exercise and effect. It is highly important that the total situation in which the drill occurs be as meaningful as possible. When the situation has meaning, things are learned which fit into a pattern and thus have significance for the individual. The educational value of bits of skill acquired in isolation through blind mechanical repetition is questionable, to say the least.

Errors in algebra. During recent years, a number of studies of pupils' errors as a basis for remedial work have been made. Several such studies have been made in the field of algebra. Similar results have been secured in different sections of the country—a fact which indicates that the teaching and learning situation in algebra is about the same almost everywhere. Conoly²¹ studied the types of errors made by the pupils in two schools. In her investigation she used the *Hotz Algebra Scale, Form A*. A total of 5,316 errors were found and were classified under three types. Approximately 38 per cent of these errors were due to a lack of comprehension (Type I); 41 per cent, to a lack of skill (Type II); and the remaining 21 per cent, to uncompleted or unattempted problems (Type III).

Fossler²² made a somewhat similar investigation. He studied by means of the *Douglass Standard Diagnostic Tests for Elementary Algebra* the errors made by students who had completed one year of the subject. The errors made by two hundred high-school students, 2,254 in number, were classified and listed as shown in Table XLIV.

The omission of the middle term in squaring a binomial,

²¹ Conoly, Mary MacLean, *op. cit.*, pp. 52-59.

²² Fossler, M. L., "A Study of the Errors Made by Students Who Have Completed First-Year Algebra as Shown by Douglass Standard Tests for Elementary Algebra," master's thesis, University of Iowa, 1924.

cancellation of common terms instead of common factors in fractions, and the omission of the common denominator in the addition of fractions are presented by Theodore Kambour²³ as types of mistakes caused by carelessness. An important consideration is presented by E. R. Breslich

TABLE XLIV

THE NUMBER AND TYPE OF ERRORS IN ALGEBRA
MADE BY HIGH-SCHOOL PUPILS. (*After Fossler.*)

<i>Type of Error</i>	<i>Number of Errors</i>	<i>Per Cent of Total Errors</i>
Exponents.....	606	26.9
Signs.....	550	24.4
Operation of Problem.....	521	23.1
Coefficients.....	218	9.7
Terms.....	134	5.9
Miscellaneous.....	128	5.7
Letters.....	97	4.3

when he points out that the understanding of a process does not necessarily accompany its manipulation. Lack of understanding, then, may produce difficulties.

Dickinson and Ruch,²⁴ of the University of Iowa, made an investigation of the difficulties of factoring. Six hundred pupils were given eight tests of twenty examples each in the eight classes of factoring. A ninth test made from three examples from each of the tests was used as a control so that the difference between the "segregated" and the "mixed" presentation might be found. The mixed presentation proved to be more difficult. Their other conclusions indicate that uncommon cases of factoring should give way to mastery of equations and formulas with sub-

²³ Kambour, Theodore, "Fraternal Orders in Algebra," *School Science and Mathematics*, 1932, Vol. 32, pp. 184-199.

²⁴ Dickinson, E. L., and Ruch, G. M., "An Analysis of Certain Difficulties in Factoring in Algebra," *Journal of Educational Psychology*, 1925, Vol. 16, pp. 323-328.

scripts, primes, decimal coefficients, and upper- (capital) and lower-case letters. During the second semester of a first-year class, Virginia Wattawa²⁵ noted 407 errors. Of these, 344, or 85.4 per cent, were in arithmetic, signs, copying, use of wrong operation, and difficulties in comprehension. From twenty-five years of teaching, Wilbur A. Coit²⁶ considered the difficulties of his students working simple and quadratic equations due to lack of skill in addition and subtraction of fractions and substitution, and inability in handling negative numbers. Tests in elementary algebra given in 1926-1927 to ten sections ranging from 9B to 12A, in four high schools of Seattle, yielded an average of about 230 errors. The results showed difficulties in "fundamental concepts and skills."

In an early diagnostic study, five tests covering multiplication of a binomial by a number, reduction of fractions to a common denominator, solution of equations in the form of $\pm ax = \pm b$, transposition, collection of terms, and solution of simple equations were given to 275 first-year students in two city high schools in March, 1914, by W. S. Monroe.²⁷ Use of the wrong sign was the most frequent mistake. Errors in arithmetic were outstanding, followed by mistakes in copying and in the middle term of a binomial as well as the omission of the x -factor of a term. Glenn R. Pease²⁸ constructed tests covering the content of first-year algebra. He gave these to 350 first-year pupils from four representative high schools in Iowa

²⁵ Wattawa, Virginia, "A Study of Errors Made by a Ninth Year Algebra Class," *The Mathematics Teacher*, 1927, Vol. 20, pp. 212-222.

²⁶ Coit, Wilbur A., "Preliminary Study of Mathematics Difficulties," *The School Review*, 1928, Vol. 36, pp. 504-509.

²⁷ Monroe, W. S., "Measurements of Certain Algebraic Abilities," *School and Society*, 1915, Vol. I, pp. 393-395.

²⁸ Pease, Glenn R., "An Analysis of the Learning-units in N Processes in Algebra," *The Mathematics Teacher*, 1929, Vol. 22, pp. 245-283.

and Missouri, and found that functional or process errors topped the list with 31 per cent of the total; sign error followed with 22 per cent; unclassified were 11.4 per cent; exponents were 8.5 per cent; and 8.2 per cent were mistakes attributed to carelessness. The study by MacRae and Uhl²⁹ indicates that algebraic errors involving multiplication and division are of most frequent occurrence.

Special disability in algebra. Closely related to the problem of difficulties is that of special ability or disability in algebra. There is no doubt that pupils vary widely in ability in the subject. The problem here, however, is whether these are special disabilities, and, if so, what their nature is. Are they innate? If acquired, what are their causes? How can such disability be overcome? These are some of the questions which may be raised. Symonds³⁰ studied the problem through an elaborate testing program. He made no attempt to determine the nature of such disabilities other than by correlating ability in algebra with performance on a large number of psychological achievement tests. He found cases in which there were wide differences between the standing of pupils in intelligence and algebraic abilities. To what extent these differences were due to lack of interest, unreliability of measures, and the like, he was unable to state. From what we know of the unreliability of standardized tests for high-school use, much of the discrepancy between scores may be explained on that basis.

Factors of success in algebra. It is important in teaching any subject to know what are the factors which make

²⁹ MacRae, Margaret, and Uhl, W. L., "Types of Errors and Remedial Work in the Fundamental Processes of Algebra," *Journal of Educational Research*, 1932, Vol. 26, pp. 12-21.

³⁰ Symonds, P. M., "Special Disability in Algebra," *Contributions to Education*, Teachers College, Columbia University, 1923, No. 132.

for success in the subject. In general, it is difficult to state many of these in precise terms. Not only are there a number of factors which may be conducive to success or failure, but these may operate in a number of combinations. Frequently, when a complex of factors which is difficult of analysis is encountered, it is referred to as special ability or disability. A good illustration of such a statement is furnished by Symonds.³¹ We may restate some of his statements relative to disability in terms of special ability:

1. One meaning, then, of special ability is the positive difference between ability in algebra and general intelligence.

2. A second meaning is the presence of special aptitude in algebra.

3. Another meaning is actual innate ability. By this is meant special neurological functioning which causes the positive difference between intelligence and ability in algebra.

4. Still another meaning refers to habits and attitudes which are helpful in learning.

The last statement is probably the truest in most cases; but, whatever the cause and meaning of special ability, there seems to be little doubt that some pupils do possess the ability to learn algebra with greater facility than their scores on a test of general intelligence would indicate.

The correlations which have been found between algebra and the other subjects usually mean very little for the simple reason that no statement is given as to the sampling involved. Then, too, many of the measurements on which scores are based are not highly reliable. Symonds³² estimates from a number of studies that the true

³¹ Symonds, P. M., *op. cit.*, p. 2.

³² *Ibid.*, p. 59.

correlation between algebra and geometry is about .82 for the general population and .73 for high-school freshmen.

The studies disagree very radically as to the relationship between ability in arithmetic and ability in algebra. Thorndike³³ found a correlation of .74, while correlations as high as .99 and as low as .28 have been found.³⁴

Algebraic ability seems to be rather highly correlated with intelligence. Thorndike found that both algebraic computation and problem solving depend "emphatically on intellectual ability."

While there is little objective evidence on the subject, yet we may be sure that study habits play an important role in the learning of algebra. Ability to pay attention, to think in abstract terms, to creatively image processes, or to develop meanings for symbols is probably influenced by training of the mental processes which are elements of study habits and which may be brought to bear more directly on problem situations.

It has sometimes been stated that boys excel girls in ability in algebra. The experimental studies do not bear out this claim. A number of studies based on school marks show that in some situations boys on the average surpass girls, while in others the girls are superior. Cameron³⁵ in a very extensive study found through the use of tests that in both mechanical calculation and intelligent manipulation of abstract quantities, the boys' and girls' achievement was approximately equal.

If the problem of interests is studied, it is found that

³³ Thorndike, E. L., "The Abilities Involved in Algebraic Computation and in Problem Solving," *School and Society*, 1922, Vol. 15, pp. 191-193.

³⁴ Brown, W., "An Objective Study of Mathematical Intelligence," *Biometrika*, 1909-1910, Vol. VII, pp. 353-367.

³⁵ Cameron, Annie E., "A Comparative Study of the Mathematical Ability of Boys and Girls in Secondary Schools," *British Journal of Psychology*, 1925, Vol. 16, pp. 29-49.

boys, as a rule, place algebra higher in a list of the school subjects than do girls. Why this is true, no one at present knows. The best explanation appears to lie in the supposition that algebra deals more with problems with which boys come in contact. There is no reason for supposing that there is any innate difference which could account for the difference in preference.

Measurement and diagnosis in algebra. Algebra occupies about one-fifth of the pupil's time in the ninth grade. It exerts an important influence on the secondary curriculum, and much of the pupil's time and efforts are devoted to learning the skills and principles involved. Since it exerts such an important influence, it is desirable that some measure of whatever is being accomplished should be secured. One of the purposes of measurement is to determine the degree to which pupils have attained the aims set forth for the subject.

There are many problems in measurement in algebra that are still untouched. The fundamentals are very well taken care of in that there are a number of tests and scales which measure achievement in them fairly adequately. Smith and Wright state:

Testing in the field of algebra should include: (1) inventory tests, (2) survey achievement tests in algebra computation and problem solving devised to give speed and accuracy measures if desired, (3) diagnostic computation tests, (4) diagnostic problem solving tests, (5) individual diagnosis charts in computation, (6) individual diagnosis charts in problem solving, (7) practice tests or drill pads, (8) tests of social traits and disciplinary values in algebra.³⁶

³⁶ From *Tests and Measurements*, 1928, p. 112. (Used by permission of the authors, Henry Lester Smith and Wendell W. Wright, and the publisher, Silver Burdett Company.)

Algebra tests may be classified as:

1. Survey.
2. Diagnostic.
3. Prognostic.
4. Vocational.
5. Miscellaneous.

Tests may fall in more than one group; that is, they may have value for several purposes. In general, a survey test should yield a single score, since its chief purpose is one of comparison. In survey work, measures that give achievement scores which may readily be compared with those secured in other school systems are desired.³⁷ Diagnostic tests and scales usually do not provide a total score, since their purpose is to show pupil achievement in a number of fundamental elements. The function of these measures is to show the teacher the weak and strong points in the achievement of pupils. There are a number of diagnostic tests available for measuring algebra abilities. The prognostic tests are still limited both in number and in serviceability. Such tests purport to forecast the student's probable success in algebra. However, there is some promising work being done in this field and in the work on vocational guidance. The *Thurston Vocational Guidance Test* includes a test of algebra along with tests in five other fields.

Teachers and supervisors have a tendency to use standardized tests merely for the purpose of determining grade and pupil achievement. Although this may be valuable and desirable, tests should be used much more widely for

³⁷ The *Sones-Harry High School Achievement Test*, published by the World Book Company, Yonkers-on-Hudson, N. Y., is an example of a survey test covering language and literature, mathematics, natural science, and social studies.

the purposes of finding weaknesses in instruction and of aiding in the diagnosis of pupil difficulties in learning. Fossler³⁸ used the *Douglass Algebra Tests* for the purpose of determining the errors made by pupils who had completed first-year algebra. His findings are given in Table XLIV. Such findings give the teacher information relative to the weakness of her students which is of special value for developing a program of remedial work.

B. Geometry

The meaning of geometry. Geometry as usually taught in high school is largely a pure science dealing with space. As the science of space, it is concerned largely with concepts with which children are already at least partially familiar. As a pure science, geometry is taught primarily for its own sake. Much of its content is familiar in a vague way to most students before they enter high school.

Geometry treats of lines and forms which are in the child's experience—all children develop concepts of lines and figures. The differences in these concepts are to be found in the nature of the experiences which the individual pupils have had. Geometry is, however, more than information concerning space as it is ordinarily perceived: it is a form of thought as well. Ordinary experience gives only unsystematized and vague information concerning such space relations as form and size. Geometry, on the other hand, is a special study which analyzes and formulates facts and relations having to do with space. Geometry is to be contrasted with algebra in that the former is the science of space while the latter is

³⁸ Quoted by Smith, H. L., and Wright, W. W., *Tests and Measurements*, New York, Silver, Burdett Company, 1928, p. 117.

the science of numbers. Every subject uses language of some kind for the purpose of organization and thought.

Objectives of geometry teaching. The objectives of instruction in geometry have been variously stated. Probably they may be given for geometry, as for all other subjects, as cultural, disciplinary, and practical. It is very difficult to separate these aims in our thinking without doing violence to the facts which we know concerning the development of an individual. However, we may think of certain materials as being useful for pupil growth in certain directions. In the case of geometry, the disciplinary aim is probably of more importance than either of the others.

This disciplinary aim relates to the development of certain mental habits and attitudes which are to be distinguished from the more specific skills which are considered in connection with the utilitarian aim. The latter aim relates to the organization in a systematic manner of the information which the student already has about space. Geometry teaching probably does not give many new concepts about space as such, but makes much more definite through a study of measurements and relations those experiences which the pupil already possesses. While this aim is concerned with the development of generalized concepts, the cultural aim refers to the understanding or appreciation of the logical reasoning, precision, and accuracy of form present in geometrical processes. It is concerned with the role that mathematics has played in the various developments of the civilization.

Little discussion of practical aims is necessary. These aims involve the development of such fundamental information as is in the background of accurate thinking. It is recognized that there is a spatial factor in practically all

of our thinking and that this is made more definite and meaningful by experiences gained in studying geometry.

If pupils are to be given a knowledge of the facts of geometry which will be useful to them, they must not only learn propositions but must also learn to make some application of them. Mere knowledge of a fact is no guarantee that it has practical value. If the content of geometry is to have practical value in the daily life of the pupil immediately and in the future, the pupil must have practice in the solution of problems met in daily life outside the school as well as of problems met inside the schoolroom.

The psychology of space. In an earlier paragraph it was stated that geometry is the science of space. In a study of the psychology of geometry teaching and learning, it is desirable to make a brief survey of the ordinary spatial experiences of the individual and of how notions concerning space arise.

All sensations have at least three aspects or attributes: quality, intensity, and duration. Most sensations also have a fourth attribute, which is usually called *extensity* or *voluminousness*. The attributes of duration and extensity are the basis of our percepts of time and space. In analyzing our experiences, it is interesting to note that all objects are perceived in a temporal spatial setting. When an object is perceived, it is apprehended as of a certain size and shape, as in a certain direction from the perceiver and from other things, and as of a certain distance from the perceiver and from other things.

In a very real sense we do not perceive a definite thing called *space*. We rather perceive objects or things which have certain spatial relations to each other and to us. Objects are perceived in certain distances, directions, and positions. We speak of the spatial relations between ob-

jects as the "perception of space." When we attempt to analyze the development of space perception in the child, we find that the senses which furnish the sense data from which perceptions of space develop in the child are two, the visual and the cutaneous.

Since spatial concepts are learned, it might be well to think of the subject genetically. Anyone familiar with the behavior of a very young child is aware of the fact that it has very little control over its movements. Touching the child at almost any point of the body will lead to movements of the arms and legs. Gradually, through his random, indefinite movements, the child learns to localize different points on the body. Through reaching for objects it acquires at first vague notions of distance and size. At the same time its movements are becoming more highly co-ordinated. Space as it appears to the adult is but an extension of the crude developments in infancy. Space perceptions are the result not of one factor alone, but of many: sensations from muscular movements as well as from activities of other sense organs are intergrated through experience into space perceptions.

Geometry and thought. The question might be asked, regarding any branch of study, whether it furnishes ideas, concepts, and principles which may be used in a wide variety of situations. A subject may not only furnish concepts useful in many situations but may also influence the general background, point of view, or attitude of the individual in all his thinking. The value of a subject for development is to be judged by the extent to which it facilitates and colors thought. Thus, we may say that certain subjects are more educative than others in that they influence the pupils' ability to react accurately, fully, and with understanding more than do others.

The educative value of geometry is great in that it affects the fundamental mental background in which all thought occurs. Most of our thinking has some reference to time or space or both. Geometry as the science of space³⁹ furnishes a study of the relations of lines, planes, and figures of three dimensions.

Since geometry is a subject dealing almost wholly with the development of mental content, it is highly important that the principles underlying learning and thinking be kept constantly in mind in the teaching of the subject. Touton, in a study of 2,800 plane geometry examination papers written by New York second-year high-school pupils in their Regents' examination, suggests a formulation of the steps of the thought processes involved as follows:

- I. Identification of:
 - A. All given elements (facts or relations).
 - B. Elements of the desired outcomes (facts or relations to be proved).
- II. Search for:
 - A. A direct outcome of each given element considered alone and apparent implications of the desired outcome.
 - B. Situations (combinations of elements) which do or would involve known elements, or better, known elements and the desired outcomes.
- III. Selection of a certain situation because it involves most known elements or potent elements which give promise of being useful in reaching or leading toward the desired goal.
- IV. Utilization of a situation and its outcomes as a new situation, etc., leading toward the desired outcome. This step includes or may include:
 - A. The testing of a selected situation and its outcomes in an effort to reach the desired outcome, or

³⁹ Judd, C. H., *Psychology of Secondary Education*, Boston, Ginn and Company, 1927, Chap. V.

- B. The testing and rejecting of a selected situation and its outcome as of no worth in reaching the desired outcome, or
 - C. The testing and rejecting as in B above followed by the drawing of construction lines, which provide a new situation to be tested as in A or B above.
- V. Verification of conclusions in:
- A. Problems involving numerical data through interpretation or a checking of results.
 - B. Problems involving construction through the consideration of limiting conditions and proof that the construction is correct.
 - C. Problems involving proof through syllogistic organization.⁴⁰

Pupils' interest in geometry. It is apparent that pupils may be interested in the facts of geometry, in the thought processes involved in the demonstration of facts, or in both. If pupils are interested only in the facts of geometry, its value as an educational subject is questionable.

Experience shows that one of the best methods of developing interests in a subject is that of relating it to something in which the pupil is already interested. Experience further shows that when a particular problem is interesting to the pupil, he will bring in all the subject matter that will help him to solve it or to improve upon a previous solution. Having once found a genuinely important and interesting problem, the teacher may with profit come back to it with his class again and again in the light of new subject matter.

The topics in plane geometry which are considered (*a*) the most popular and (*b*) the most unpopular have been

⁴⁰ Touton, F. C., "Solving Geometric Originals," *Contributions to Education*, Teachers College, Columbia University, 1924, No. 146, pp. 81-82.

studied.⁴¹ These are presented in Table XLV. A fact not revealed in the table is that the number of pupils who selected constructions as the most popular topic was larger than the number who selected any of the other topics.

TABLE XLV

THE FOUR TOPICS IN PLANE GEOMETRY LIKED BEST AND THE FOUR LIKED LEAST WITH THE REASONS FOR SUCH LIKING

The Topics Liked Best, with Reasons

		<i>Interesting</i>	<i>Useful</i>	<i>Easy</i>	<i>Good Mental Training</i>	<i>Interested in Drawing and Measuring</i>	<i>Accuracy Required</i>	<i>Independence</i>	<i>Like a Puzzle</i>	<i>No Reason</i>
(1)	Construction....	47%	6%	12%	8%	11%	1%	2%	1%	2%
(2)	Triangles.....	38%	22%	17%	11%	10%	2%	—	—	—
(3)	Circles.....	60%	7%	18%	15%	—	—	—	—	—
(4)	Originals.....	37%	6%	3%	30%	2%	—	18%	—	4%

The Topics Liked Least, with Reasons

		<i>Too Difficult</i>	<i>Indefinite</i>	<i>Uninteresting</i>	<i>Not Useful</i>
(1)	Originals.....	75%	3%	22%	—
(2)	Loci.....	65%	17%	18%	—
(3)	Triangles.....	42%	—	20%	38%
(4)	Circles.....	50%	16%	31%	3%

The ease or difficulty which pupils find certain phases of the subject to possess determines their interest in it in a large measure. Undoubtedly pupils are often called upon to solve problems when their background of training and experience is inadequate. Pupils are interested in manipulating things, whether these be ideas or objects.

⁴¹ Report, *op. cit.*, p. 521.

Judd has emphasized the interest of pupils in logical relations in the following paragraph:

Teachers have taken much too little advantage of what may be called the logical interests of pupils. Pupils' minds are attracted by the possibility of formulating trains of ideas in a coherent way. The pupil who becomes absorbed in the solution of an original exercise in geometry exhibits in a very striking way a logical motive which is stronger than any practical motive. The enthusiasm of a pupil who has learned how to prove his results needs no external stimulation. The pupil who really understands mathematics is so bent on establishing a defensible conclusion that he is restless until he has mastered his problem. The mind which has felt a logical need and has met this need by genuine personal endeavor is more highly trained than is the mind which is driven to its tasks by social or practical motives.⁴²

It is obviously impossible to attempt to develop an interest in geometry in pupils of inferior ability. The child of low intelligence is unlikely to reach the senior high school, and, if he does, he will not be likely to elect geometry. However, in geometry classes pupils are found who range very widely in ability as measured by general intelligence tests. It has been estimated that a pupil with an intelligence quotient of less than 108 usually is unable to attain a reasonable mastery of first-year algebra.⁴³ Geometry probably makes even greater demands on the ability to do abstract thinking. Pupils who are unable to develop this ability become hopelessly confused and as a result dislike the subject.

Sex differences. Touton⁴⁴ made a study of sex differ-

⁴² Judd, C. H., *Psychology of Secondary Education*, Boston, Ginn and Company, 1927, p. 146.

⁴³ *Second Yearbook*, The National Council of Teachers of Mathematics, 1927, p. 246.

⁴⁴ Touton, F. C., "Sex Differences in Geometric Abilities," *Journal of Educational Psychology*, 1924, Vol. 15, pp. 234-247.

ences in different types of geometric abilities. The results from a study of data on 2,800 pupils on the June, 1918, Regents' examination indicated a qualitative sex difference. The construction type of problem made a decidedly stronger appeal to boys than to girls. The difference found, 61 per cent of the boys excelling the median girl, is higher than results obtained by more recent investigations. Perry⁴⁵ in an investigation found that boys were superior to girls in initial and general mathematical ability and in reasoning. Only in exceptional instances, however, did their average achievement excel that of girls.

Another study, by Webb,⁴⁶ was designed to determine the extent to which boys and girls of approximately equal mental ability—as determined by a standard intelligence test—differed in their geometric ability. Instead of dealing with mass measures, as most of the other investigators have done, Webb classified the subjects within a sex, for comparison, into groups of equal, or approximately equal, mental ability.

In this study 264 boys and 506 girls were classified according to their mental age and chronological age. These subjects were given the *Webb Geometry Tests*. From the results, Webb concluded:

- (1) The superiority of boys over girls in geometric ability is most marked at the lower mental levels.
- (2) Girls of mental ages of more than 18 years and 6 months (superior) excel boys of equal mental ability.
- (3) Girls, on the average, attain one more year of

⁴⁵ Perry, Winona M., "Are Boys Excelling Girls in Geometric Learning?" *Journal of Educational Psychology*, 1929, Vol. 20, pp. 270-279.

⁴⁶ Webb, P. E., "A Study of Geometric Abilities Among Boys and Girls of Equal Mental Abilities," *Journal of Educational Research*, 1927, Vol. 15, pp. 256-263.

mental maturity than boys before their achievement in geometry is comparable to the average for boys.

Mental processes in learning geometry. The teacher should keep in mind the fact that the pupils use certain mental processes in their study and that these processes result in the attachment of meanings to either images or words. The language ability and the type of images which the pupil has determine in no small measure his ability to learn geometry. If the teacher has a clear knowledge of what is to be learned, of what information the pupil already has, of what his ability is, and of how pupils develop meanings and an understanding of logical relations, he should be better able to guide the learning of his pupils.

Some of the mental processes involved in studying geometry can be stated in the following manner:

1. Securing a clear notion of what is to be done.
2. Conceiving the figure which is to be used.
3. Determining just what is to be done to the figure, what feature is to be used, and what additional lines are to be drawn, so as to select memories and facilitate logical thinking.
4. Grasping all the essential elements which lead to a conclusion.
5. Arrangement of the essential elements in logical sequence.

a. Reviews and drills. Too often the major purpose of drill is conceived of as the correction of wrong habits. These wrong habits are oftentimes the result of the pupil's not knowing the points to study and the approach to make to the study materials. Thus, he will in many cases repeat meaningless materials and review in a haphazard

way. Such a procedure may actually be harmful in nature, in that it tends to counteract the painstaking efforts of the teacher to establish the right habits of work and to develop worthwhile concepts. The study of geometry affords the student an opportunity to conduct a sort of drill of a meaningless type on the difficult materials, so that his work in geometry becomes a memory process. Drills of such type are harmful. Concerning this Archibald Henderson says:

The most frequent fault of the pupil expresses itself in the statement: "I don't know how to begin." The reasons for this are two. In the first place the pupil has been accustomed to memorize the demonstration; and inability to proceed indicates, first, forgetfulness—mnemonic loss. In the second place, the pupil has not been taught the principles of geometrical analysis and the orderly arrangement of his knowledge of geometrical theorems. If the pupil has been trained to deal with each problem as it arises, in the light of the knowledge already acquired from previous theorems, and to analyze the problem in a scientific manner, many of his difficulties will disappear. Under such a system of instruction it will not be necessary for him to memorize the demonstration in order to reproduce it: he will be able, in general, to reproduce it logically as a consequence of preceding theorems.⁴⁷

If geometry is going to function in a pupil's life, it must have meanings. Drills and reviews should have as their purpose the establishment of materials in a more meaningful and permanent manner. Associative drills, review of originals, and varied drills will tend to thwart the type of memory work to which Henderson refers.

Measurement and diagnosis in geometry. The confusion in the teaching of geometry which is apparent in

⁴⁷ Henderson, Archibald, "The Teaching of Geometry," *The University of North Carolina Record, Extension Series*, 1920, No. 39, pp. 11-12.

the different types of content advocated by various teachers of geometry and the different aims stated is also to be found in the attempts to measure teaching outcomes. One reason for the confusion as to aims in the field of geometry lies in the fact that there has been a tendency to mix intuitive and demonstrative geometry.

A good beginning has been made in measuring the results of teaching in this field. Mimmick was the first to construct geometry tests that were widely used. He made a study of the abilities fundamental to a study of geometry. The following abilities are considered the most important⁴⁸:

1. The ability to draw a figure for a theorem.
2. The ability to state the hypothesis and conclusion accurately in terms of the figure.
3. The ability to recall additional known facts concerning the figure.
4. The ability to select from all the available facts, those necessary for a proof, and to arrange them so as to arrive at the desired condition.

Several tests designed to diagnose pupil difficulties in geometry have been developed. They are of limited value because they attempt to measure only the more formal aspects of geometry and because the scoring is not as objective as is desirable. Tests of a survey type designed to measure the level of achievement have been devised and are used in connection with the classification, promotion, and vocational guidance of high-school pupils. Tests have been developed for measuring various types of geometry ability. Some of these tests have been found to have definite prognostic value, but remedial measures

⁴⁸ Mimmick, J. H., "An Investigation of Certain Abilities Fundamental to the Study of Geometry," Ph. D. dissertation, University of Pennsylvania.

must still be found by the teacher through new-type tests and in a careful analysis of each pupil's work. The type of difficulty in learning geometry which each pupil has should be noted. Mass instruction is as difficult in geometry as in any of the other subjects.

Thought Problems

1. Why is high-school mathematics divided into different parts? Present arguments or facts in favor of and opposed to such a division.
2. What are some difficulties encountered in mathematics?
3. What are the advantages of teaching the tool operations in terms of meaning rather than manipulation?
4. Give in a paragraph a statement of what geometry means to you. What is your conception of the subject? Of what does it treat?
5. What reasons may be given for studying geometry? What may we say that a study of geometry does to the pupil? What is meant by the expression "disciplinary aims"?
6. In your experience have you found pupils interested in geometry? Why is it often difficult to develop an interest in geometry? State several methods that successful teachers have used.
7. Devise a new-type test for the purpose of measuring achievement in geometry.
8. State reasons why algebra should or should not be taken by most high-school pupils.
9. List in 1, 2, 3-order the abilities that a study of algebra develops in the individual. What abilities are needed in studying algebra?
10. Why is algebra not as interesting for most children as some of the more concrete subjects? State ways in which successful teachers motivate the work in algebra.
11. What is meant by a special disability in algebra?
12. If test papers are available, study the errors made by a group of pupils. Are there certain errors which seem to be common to the work of most pupils? Are there others which might be regarded as individual?

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For rather complete studies relating to the various phases of the curriculum, organization, teaching, and administration of mathematics, see the various *Yearbooks* of The National Council of Teachers of Mathematics, Bureau of Publications, Teachers College, Columbia University.

For a selected list of recent references on instruction in *mathematics*, see: Koos, L. V., *et. al.*, "Selected References on Secondary School Instruction," *School Review*, 1936, Vol. 44, pp. 141-145; Wren, F. L., "A Survey of Research in the Teaching of Secondary Algebra," *Journal of Educational Research*, 1935, Vol. 28, pp. 597-610.

CHAPTER XIV

Psychology and the Natural Sciences

What is meant by *science*? This question would be answered in various ways by different people. Science is regarded by many people as something mysterious. The newspapers are largely responsible for this point of view. Their headlines frequently run: *Science Discovers . . .* ; *Science Finds . . .* ; and the like. The average newspaper reader is acquainted with neither scientists nor scientific methods, and in his uncritical thinking regards science as something bordering on the mysterious or occult.

Another point of view regards science as classified knowledge concerning the correctness of which there is a high degree of certainty. That is, it trusts that when the phenomena are tested again by the same methods, the same results will be secured, and that therefore the same classification may be made. When these phenomena refer to the natural world, they are called the *natural sciences* in contrast to the *social sciences*, which refer more specifically to human relationships. The latter, however, in the strict sense of the term, are a part of the natural world.

Sometimes science is considered more as a method of work. In this sense, science teaching lays emphasis on the development of certain habits and methods of work. Within limits scientific methods, carefully controlled experiments, and quantitative statements are applicable to all fields of knowledge. Certain subjects which relate to

the natural world, such as chemistry, physics, and the various branches of biology, may each be considered as a group of related problems which have been studied by scientific methods, methods that are more or less organized according to definite laws and principles.

The world as understood by man is not composed of discrete groups of phenomena totally dissimilar to each other. Just the opposite is true: there is a oneness, a unity, in all nature. Only arbitrary divisions can be made and related problems only arbitrarily grouped together as one body of knowledge. The interests of the individual worker, the methods of study used, the types of phenomena involved, and other factors account for our present organization of scientific knowledges under the names of *physics*, *botany*, *zoology*, and so on. There is great overlapping between many of the fields, and some branches of science are composed almost entirely of borrowings from other fields. Such is the case with medicine and, to a somewhat lesser degree, with geography. Since there is a great overlapping between fields, it is imperative that teachers of any branch of science have a background of information at least in the closely related sciences.

How do the sciences differ? If one wishes to group the sciences according to the materials studied and the definiteness of the solutions arrived at, physics and chemistry may be conceived of as groups of problems which have been isolated and solved and which deal largely with the physical elements and relations of the world. These two branches of knowledge are, therefore, generally considered more closely related to each other than either is to the biological sciences, where the solution of problems is less definite and less capable of quantitative expression. Physics is dependent on methods of work secured from

mathematics to a much greater degree than is chemistry. The latter, on the other hand, is more largely a laboratory subject and can hardly be studied successfully outside of the laboratory. All scientific study depends on situations in which phenomena may be accurately observed. In chemistry it is necessary to create situations because outside the laboratory there are very few situations where chemical relations and properties may be studied.

In the biological sciences, much observation can be directly made outside the laboratory. This gives biology a tremendous advantage from the standpoint of the teacher and learner. The materials and processes of the biological sciences are, as a rule, more familiar to the student than are those of chemistry. Physics, in like manner, can be built on the previous experience of the child. In fact, much of physics consists in refining and restating experiences which children already possess. Laboratory exercises are frequently necessary for the development of accurate verbal and mathematical statements for things which students already know partially. The thought of the sentence above might be stated in another way by saying that controlled laboratory work is necessary in physics in order to develop habits and attitudes of accurate observation and statement, and not because many of the phenomena studied cannot be found outside the laboratory.

What should a study of science do for the pupil? There are many ways of looking at what is to be accomplished through a subject. Scientific schools will undoubtedly produce a "scientific nation," by which is meant a nation great in invention and the use of natural forces and resources. All this can be accomplished only by per-

sons trained in the application of scientific knowledge and method. A more direct way of considering the outcomes of a study of science, therefore, is to examine and try to state what attributes such a study may be expected to develop in the pupil.

Science teaching as it modifies and develops pupil behavior results in knowledges, habits, attitudes, and interests. The general objectives of a study of the sciences may accordingly be stated as follows:

1. To give accurate and useful knowledge of scientific facts and laws.
2. To develop habits of work which lead to accurate results.
3. To develop scientific attitudes toward problems and movements.
4. To develop interests in scientific knowledges, methods, and problems.

There is some overlapping in the statement of these objectives. They all must be regarded as psychological, since they emphasize the point of view that objectives are to be considered habit systems or patterns of behavior developed in the individual as he reacts under guidance (teaching) to natural phenomena.

A study of the objectives of science teaching will reveal the fact that they are different aspects of the same thing. The objective of all instruction is habit formation. In this case, the four statements above attempt to tell more specifically the kind of habits in which desirable science teaching results.

A good measure of the content current in our thinking is to be found in the relative amount of the different types

of materials found in our reading content. Searle and Ruch¹ studied a large number of widely read magazines with respect to the comparative importance of the different sciences as judged by the amount of space devoted to each. The findings of their study are given in Table XLVI. An examination of the table shows that the biological content was greater than the content of all the other sciences combined. Another study was made by Hopkins,² who was interested in magazine and newspaper articles as they related to the work of the high school in

TABLE XLVI

AMOUNTS OF VARIOUS TYPES OF SCIENCE MATERIALS PRESENT IN CURRENT READING.
(After Searle and Ruch.)

<i>Sciences</i>	<i>Words</i>	<i>Per Cent</i>
Agriculture.....	113,971	2.4
General.....	199,495	4.0
Chemistry.....	264,309	5.1
Physics.....	1,278,962	26.3
Biology.....	3,161,110	62.5

science. His data, given in Table XLVII, were secured from a study of four newspapers and the following magazines: *The Country Gentleman*, *The Farm Journal*, *The Saturday Evening Post*, and *The Literary Digest*. If we may in any way estimate man's activities in terms of reading materials, the biological sciences certainly appear to occupy a good share of his attention.

The kind of teaching which leads to rote learning usually eventuates in information only. The teacher should remember that this type of teaching has little permanent

¹Searle, A. H., and Ruch, G. M., "A Study of Science Articles in Magazines," *School Science and Mathematics*, 1926, Vol. 26, pp. 389-395.

²Hopkins, L. T., "A Study of Magazine and Newspaper Science Articles with Relation to Courses in Science for High School," *School Science and Mathematics*, 1925, Vol. 25, pp. 793-800.

TABLE XLVII

 DISTRIBUTION OF SCIENCE ARTICLES IN MAGAZINES AND NEWSPAPERS.
 (After Hopkins.)

Subject	Newspapers				Magazines			
	Number of Articles	Number of Inches	Per Cent of Articles	Per Cent of Inches	Number of Articles	Number of Inches	Per Cent of Articles	Per Cent of Inches
Astronomy.....	7	135	1.3	3.4	26	543	1.2	1.9
Biography.....	9	54	1.7	1.3	71	3,167	3.2	11
Biology.....	318	2,512	60	63	364	7,937	15.8	27
Chemistry (Theoretical) .	—	—	—	—	19	78	0.9	2.7
Chemistry (Applied).....	11	49	2	1.2	85	823	3.8	2.8
Geology (Theoretical)....	—	—	—	—	22	413	1.0	1.4
Geology (Applied).....	71	409	13	10.3	5	621	0.2	2.2
Physics (Theoretical)....	—	—	—	—	61	1,090	2.7	3.8
Physics (Applied).....	88	612	17	15.4	1,585	14,017	71	48
Psychology.....	28	200	5.2	5	—	—	—	—
Total.....	532	3,971			2,238	28,689		

positive influence in the lives of pupils. The subject matter in science is nothing more than materials used for the purpose of furnishing pupils worthwhile problems about which they may be active. The main thing for the teacher to keep in mind as she teaches science is that subject matter is selected and taught with producing changes in boys and girls the sole object in view. These changes should result in such habits as were stated on page 347 as the objectives of science teaching. These habits, in turn, should when integrated into larger habits systems lead to the more general objectives of all education: health, good citizenship, and the like.

Children's interests in science. The scientific interests of children have not been studied in such a definite way as have their interests in certain other fields. Therefore, one of the first things that the teacher of science should do is

to make a general survey of the interests and environment of his pupils. In making such a study, the teacher must have a background of knowledge concerning the interests of boys and girls in general at each age.

A number of investigations have been made as to pupils' interests in scientific materials. It has been found that children in the primary grades are chiefly interested in animals. How animals appear and the sounds that they make are the attributes in which young children are chiefly interested. In the upper intermediate and lower junior-high-school years, pupils are more interested in the behavior of animals. Naturally, following this comes an interest in classification and identification in the senior high school.

In the early intermediate grades, animals come first in interest, plants come next, and physical facts last. However, this order is somewhat reversed by the time the pupil reaches the senior-high-school period. Pollock³ studied the interests of eighth-grade pupils by placing in the hands of each pupil a well-worded form explaining the problem in which he was interested and why. Then he asked them to make a list of five things or questions in which they were most interested. In response to his request, he received 3,500 questions. These questions indicated 199 interests. It was also found that the range of interests for the girls was 10 per cent greater than that for the boys. While there was much overlapping, the boys indicated many interests not expressed by the girls. Just the opposite was true also. The interests found in this study are grouped in Table XLVIII.

³ Pollock, C. A., "Children's Interests as a Basis of What to Teach in General Science," *Education Research Bulletin*, Ohio State University, 1924, Vol. III, pp. 1-3.

TABLE XLVIII

RANK AND FREQUENCY OF THE 42 MOST IMPORTANT SCIENTIFIC INTERESTS OF EIGHTH-GRADE PUPILS AS INDICATED BY FREQUENCY OF APPEARANCE. (*After Pollock.*)

<i>Interest</i>	<i>Rank</i>	<i>Frequency</i>	<i>Interest</i>	<i>Rank</i>	<i>Frequency</i>
Electricity.....	1	349	Volcanoes.....	21.5	38
Stars.....	2	253	Animals.....	23.5	37
Radio.....	3	243	Trees.....	23.5	37
Heat.....	4	181	Machinery.....	25.5	36
Lightning.....	5	157	Water supply...	25.5	36
Planets.....	6	146	Sea.....	27	31
Moon.....	7	120	Earthquake.....	28.5	30
Sun.....	8	98	Snow.....	28.5	30
Mars.....	9.5	97	Anatomy.....	31	27
Plants.....	9.5	97	Nature.....	31	27
Wind.....	11	86	Radium.....	31	27
Gravity.....	12	83	Food.....	34	25
Air.....	13	82	Stones.....	34	25
Aeroplane.....	14	81	Telephone.....	34	25
Earth.....	15	72	Engine.....	36.5	24
Light.....	16	57	Rain.....	36.5	24
Sound.....	17	51	Fishing.....	38	23
Gas.....	18	50	Flowers.....	39	22
Rotation.....	19	46	Photography...	40.5	21
Clouds.....	20	40	Seasons.....	40.5	21
Bacteria.....	21.5	38	Coal.....	42	20

When the data listed in the table were compared with materials found in the texts on general science, a rather small amount of overlapping was found. On the basis of this, Pollock suggests that the science teacher should not build up the science course too close to any one text, but should let the pupils' interest direct the way. Text and reference materials should then be selected in relation to the interests of the pupils.

One serious criticism of this point of view might be made, however. It is difficult to comprehend a philosophy of education which assumes that only those things in which children are interested should be taught. If this

philosophy should be followed, curriculum makers would be responsible only for finding children's interests and selecting materials so as to maintain those interests. The purpose of all education is growth, and growth is not secured by perpetuating "what is," but by starting with "what is" and progressing along clearly defined routes toward the objectives of education.

Language difficulties in science. There are at least three aspects of language which make learning activities in science difficult for pupils. In the first place, many pupils who enter high school have never thoroughly mastered the mechanics of reading. Many high-school pupils possess ability in reading no better than the average elementary pupil. Not only do many pupils read poorly in general, but there are also pupils who read one type of material well but are unable to read other types with any degree of satisfaction. There are many different types of reading, and reading is done for a large number of purposes. Judd and Buswell⁴ have shown conclusively that pupils may be able to read one kind of subject matter profitably and be unable to profit from another type. One duty of the science teacher must be to teach pupils how to read science materials. The study problem is largely a reading problem. It must not be thought that training in reading imaginative materials, such as fiction and poetry, will train for science study.

The second language difficulty is hinted at in the last sentence above. Pupils not only do not secure in the elementary grades training which leads to effective reading and study of science, but much of their training is of a directly opposite sort. The predominating aim of elemen-

⁴Judd, C. H., and Buswell, G. T., "Silent Reading: A Study of the Various Types," *Supplementary Educational Monographs*, 1922, No. 23.

tary teachers in reading, after the mechanics of reading are acquired, is literary and appreciative. The difference between a literary and a scientific use of language is well stated by Rowland as follows:

The highest literary style consists of a nice adjustment of values, where the words mean all that they possibly can, without confusing the combined meaning of them all. On the other hand, scientific style of expression differs in that the separate words are allowed only as much independent significance as is necessary for the sentence to have meaning. This prevents any doubleness of interpretation, and more can be crowded into a given space.⁵

Children enter high school lacking in elementary training in science. The fact that children enter high school with little scientific background was discussed partially in several preceding paragraphs. It exists not only because science is poorly taught or not taught at all in the elementary grades, but because the type of content desirable for the growth of scientific interests is almost entirely absent from the reading materials.

It appears that much of the difficulty of science teaching and learning in the high school is due to neglect during the period of the child's life when interests and concepts regarding the world are being formed. Probably the chief reason for this lies in the fact that persons trained in the sciences and with scientific interests are seldom interested in teaching in the grades. Most of our readers have been prepared by persons primarily interested in providing good literature for young children. Because of their training, good literature means to them the great classics composed largely of folklore, poetry, fairy stories,

⁵ Rowland, Eleanor H., "The Psychological Experiences Concerned with Different Parts of Speech," *Psychological Review Monograph Supplement*, 1907, Vol. VIII, pp. 36-37.

fables, and mythology. Because of the paucity of good reading materials in science and because of the training of elementary teachers, pupils reach the high school with a very poor basis for science learning. This makes it imperative that the science teacher provide for the best type of reading in science.⁶

Among other factors that influence high-school pupils' knowledge of science, Clem and Dudleston,⁷ after studying this problem with 1,070 pupils in 40 science classes as subjects, give along with other items the following: (1) common science knowledge consistently increases with the amount of science passed; (2) there is a definite positive relationship between knowledge of common science and age; (3) boys are superior to girls in knowledge of common science; (4) there is a definite positive relationship between average school grades and common science knowledge; and (5) the education of the parents is positively related to the amount of scientific knowledge.

Difficulties of science teaching and learning in general. When we consider the importance of science in the world and examine the place it holds in the school curriculum, we find a singular condition. Science has probably had more influence on the life of the race during the last hundred years than any single factor has ever had during a similar portion of time. Yet, when we turn to the high-school curriculum, we find that science has been practically neglected in the elementary grades. The reason for this does not lie in the fact that its importance is unrecognized by school authorities, but rather in the fact that it is in

⁶ See Garrison, S. C., "Psychology of the Sciences," *Peabody Reflector and Alumni News*, Nashville, Tenn., George Peabody College, June, 1932.

⁷ Clem, O. M., and Dudleston, J. J., "Factors Influencing the Common Knowledge of High School Pupils," *Science Education*, 1933, Vol. 17, pp. 267-272.

many—probably in most—instances poorly taught. Science teachers are not wholly responsible for this condition, since a number of factors related to the rapid development of science, the attitude of science, and traditions and practices of our schools are important.

Applications of science. Practically every teacher of sciences has at some time been confronted with the fact that the pupils are unable to apply the knowledge accumulated during the science course. Educational efforts today are bent on finding or devising means of making knowledge useful to the child in those situations in which this knowledge will function to the advantage of the individual concerned. Judd states in a rather careful manner some factors concerning transfer in which he maintains that knowledge will not of necessity transfer because there seems to be a similarity in the two situations involved. The transfer to problems very similar in nature will depend to a large extent upon the way in which the materials were learned, and this, further, is going to depend largely upon the technique of teaching.

There are several different ways in which knowledge of science may function in the life of the learner. In the first place, the pupil may be able to apply the knowledge in an identical situation, providing he recognizes the situation as identical, but still never be able to understand the principles involved in the application. In such a case, if some slight element is added to the situation changing the general pattern and meaning of the problem, the pupil's application will probably be ridiculous. Secondly, the pupil may understand the principle but be unable to see this principle in another problem similar in nature but presented slightly differently and giving a different thought pattern. Multiple-choice exercises and habits of

checking (using the reverse process) are of great value in developing meanings; the materials presented should be concrete in nature, so as to make applications meaningful and significant in the life of the learner. The ultimate hope and desire is that the pupil shall be able to generalize in such a manner that he can detect the problem situation and can take into account in the generalizations made the similarities and contrasts with problems confronted earlier.

Units in a natural science. Too often in the teaching of science the textbook assignment basis is the method used almost altogether. In such a case, the instructor is constantly testing the pupils on such principles and facts as are presented in the text. At the end of the course, however, the intellectual content will very often comprise principles and facts meaningless and isolated from reality. These will be found of little value to one in the interpretation and analysis of some aspect of his science environment. It is this method of teaching that has brought about the disappointment of some of those who were conceiving of the sciences as those subjects that prepare pupils for life activities. This lack of transfer, this inability of the students to generalize and apply the facts and principles learned to life situations, is largely a result of a lack of organization of the thought units rather than of the content of the science course.

Learning and the sciences. Some of the problems connected with learning have just been discussed under the topic concerned with difficulties in science teaching and learning. Science teachers could well afford to devote more time to a consideration of how pupils learn science and to just what it is that they get as a result of learning. Any statement of the objectives of science teaching will

give in a general way what pupils are expected to get as a result of their efforts at study. However, these are of necessity generally stated in terms of products as a whole. During recent years psychologists have devoted much time and energy to research in learning. As a result of the work, certain principles are fairly well established, although there are those who still prefer to explain learning in a theoretical way in terms of the old pleasure-pain theory or a modification, as a result of satisfiers and annoyers. Theoretical discussions of what takes place in the nervous system of the individual during learning are probably highly important from the point of view of research in the psychology of learning but have little practical value in a text for persons who are not interested primarily in psychology.

The most important single fact in the learning of boys and girls is that they learn only when they are active, and that what they learn, or what their learning results in, is determined by the type of activity in which they engage while learning and by the materials about which they are active. Boys and girls adapt themselves to natural phenomena from birth, but the purpose of their activity has seldom been that of acquiring meaning, classifying, developing principles and methods of work, and the like. It will be seen that the purpose for which one learns and the nature of his activity partially determine what he learns. In like manner, what a person can learn about a subject is partially determined by the subject itself.

All of this indicates that one important function of the teacher relates to the establishment of purposes and motives for study. In science especially, it is necessary that students have clearly in mind the purpose of the assignment. Since the methods used in study are so important,

more of the teacher's time should be devoted to setting up right conditions for work and less of it to hearing lessons. This, of course, does not mean that teachers should be negligent in finding out just what a pupil is securing from a learning activity, but that is another matter.

All learning results in the development of meanings to a greater or lesser degree. In the beginning, meanings are developed on the perceptual level. That is, objects, materials, and the relationship between these are directly perceived, and such meaning as is secured comes from actual contact with things. Later, when relationship and materials can be denoted by symbols, these are frequently substituted for the more concrete things or for the processes for which they stand. Thus, these symbols may be used for the development of meanings. How effective science teaching and learning are depends largely on the meanings developed and the facility of the pupil for thinking about and expressing them. This fact makes it important that teachers consider the development of adequate methods and vehicles for thought and expression. Many pupils are handicapped because this part of their training has been neglected. Ability to think in terms of words and other symbols is very closely related to the ability to learn science. Abstraction and generalization depend upon ability to associate meanings with words and to use words in thinking instead of the objects and relationship they represent. Some of the more commonly accepted principles of learning may be mentioned here.

a. In the first place, learning depends on the native ability of the learner. A number of studies show that there is a positive and fairly high relationship between achievement in the various sciences and native ability as measured by intelligence tests. In the Peabody Demonstration School the following correlations were secured

when the *Otis Self-Administering Test of Mental Ability, Higher Examination*,⁸ was used as a measure of intelligence and class grades were used as a measure of achievement: general science, .67; biology, .59; chemistry, .51; and physics, .61.

b. Efficiency in learning is closely associated with the previous experiences and interests of the learner. The teacher can well afford to spend some time in making a survey of the experiences and interests which children bring to their science work.

c. The child is always active and always learning something. Learning takes place only through activity. This does not mean that a pupil must be active in a physical way, as is so often inferred. It is the teacher's duty to so arrange problems in science that the pupil will prefer to be active about them.

d. Clear assignments with the purpose of the activity pointed out are conducive to good learning.

e. Accurate checking with knowledge of the results of learning on the part of the pupil shows him just what he is achieving and where he is weak. This not only points out to him what he should study but acts as a powerful motive as well.

f. In general, the size of the class and the methods of teaching (demonstration or laboratory) are of less significance in learning than motivation, the interests of pupils, the organization of subject matter, and the like. Experimental studies related to laboratory work are discussed in the latter part of this chapter.

A problem attacked by Atkinson⁹ was designed to deter-

⁸ Published by the World Book Company, Yonkers-on-Hudson, N. Y., 1922.

⁹ Atkinson, Carroll, "The Effect of Sex Differences in the Study of General Science," *Journal of Educational Research*, 1931, Vol. 24, pp. 61-65.

mine whether sex differences are closely related to ability in general science. In this study eight tests of the objective, true-false type, consisting of fifty questions each, were given to members of five general science classes in one of the Pasadena junior high schools. These tests consisted of the contents of texts in use and of experiments (laboratory) carried on as individual projects. The results of the eight tests were correlated with the I. Q. records secured from the *Terman Intelligence Tests*. Sex differences were studied, and it was found that, so far as revealed by these tests, boys are slightly superior to girls in the study of general science. The slight superiority in intelligence, as given by the Terman group test, in favor of the girls participating in this experiment tends to strengthen the significance of the small amount of superiority in science shown by the boys over the girls. The boys as a group were more variable than the girls.

The laboratory method in science. The laboratory method of instruction was introduced into high-school science work in the period between 1882 and 1890. With the ever increasing enrollment and costs of our high schools, there has been a great deal of interest in scrutinizing more closely the cost of the various teaching procedures. Again, with the ever increasing complexity of our civilization and, thus, our social life, there has come about an increase in the necessity for a further preparation of the citizens in order that they may fit into this social order and be producers as well as consumers. This greater necessity for education has led to further studies of economy in education from the standpoint of both time and money. Furthermore, the formalism of the work in the laboratory has often made the work meaningless and actually distasteful, leading in many cases to a decrease in

the enrollment and interest in the science courses. These factors have led the investigators in the field of educational research to attempt to evaluate the laboratory technique. Certainly, if there is not a substantial advantage to be gained by this method, it cannot be justified. These investigators have made comparisons between the results obtained from the laboratory method and those obtained from the lecture-demonstration technique. Table XLIX represents the immediate test results obtained from various investigations of this phase of science teaching. For detailed explanation of the science materials in-

TABLE XLIX

COMPARISON OF THE LABORATORY AND THE LECTURE-DEMONSTRATION METHODS OF TEACHING SCIENCE AS BASED UPON IMMEDIATE RECALL

			Number of Pupils Per Section	Average Score	Percentage
	Number of Exercises	Number of Sections		Lecture Demon- stration	Labora- tory Method
Anibal (1).....	25	2	23	60.71	56.45
Anibal (2).....	10	2	17	71.11	68.35
Cooprider (1).....	24	3	14	72.55	70.80
Cooprider (2).....	12	4	17	63.76	62.70
Cunningham (1).....	13	2	12	64.33	61.15
Cunningham (2).....	12	2	10	60.30	55.20
Kiebler & Woody.....	4	2	—	60.53	59.68
Wiley.....	3	3	8	56.30	56.60

cluded in each study, the reader is referred to the productions by the authors of these studies.¹⁰ An examination

¹⁰ Anibal, F. G., "A Comparative Study of the Effectiveness of Teaching High School Chemistry Through Individual Laboratory Experiment and Lecture Demonstration," master's thesis, Department of Education, Chicago University, 1924; Cooprider, J. L., "Laboratory Methods in High School Science," *School Science and Mathematics*, 1923, Vol. 23, pp. 526-530; Cunningham, H. A., "Laboratory Methods in Natural Science Teaching," *School Science and Mathematics*, 1924, Vol. 24, pp. 709-715 and 848-851; Kiebler and Woody, "The Individual Laboratory Versus the Demonstration Method of Teaching Physics," *Journal of*

of the studies made will show that chemistry, natural science, and physics are all listed. One would conclude from the results given in the table that the lecture-demonstration method is superior to the laboratory method for immediate retention.

The data for delayed recall are presented in Table L. The results in this table indicate that for retention and application the laboratory procedure is superior. The manipulatory exercises involved in the performance of the experiment, correlated with the resultant thought processes, should make the science materials more significant as a part of the life processes of the individual subject. One of the serious obstacles with which laboratory work is

TABLE L

COMPARISON OF THE LABORATORY AND THE LECTURE-DEMONSTRATION METHODS OF TEACHING SCIENCE AS BASED UPON DELAYED TESTS

	<i>Time Between Presentation and Tests</i>	<i>Average Percentage Score Lecture Demonstration</i>	<i>Laboratory Method</i>
Anibal (2).....	5 months	28	38
Coopridge (2).....	1 month	34.74	35.09
Cunningham (1).....	1 month	46.10	49.50
Cunningham (2).....	3 months	30.50	34.60
Kiebler and Woody.....	2 weeks	58.51	59.30
Wiley.....	4 weeks	38.30	39.70

so often confronted is formalism. The work is too often carried on in a very formal manner which is almost wholly out of harmony with the practical experiences and habits of the learners. The student comes to conceive of the work in the laboratory as so many somewhat artificial exercises to be performed within a limited range of time.

Educational Research, 1923, Vol. VII, pp. 50-58; Wiley, W. H., "An Experimental Study of Methods in Teaching High School Chemistry," *Journal of Educational Psychology*, Vol. IX, pp. 181-198.

The resulting meaning of these exercises to him may be naught.

Correlation of science abilities. When should specialization in the science work begin? The writers have considered this question largely from the psychological viewpoint of the individual's development, including along with this his sociological and educational environment and growth. The beginning pupil has not established habits of analyzing and synthesizing. The ability to deal with isolated elements in an abstract manner develops during the final stages of maturation of the mental abilities. During the earlier period, science materials should be closely correlated, and this correlation should never be wholly eliminated. For the duller pupils, the science work should be of a more relational and concrete type all the way through the school program.

The investigation by Carpenter was designed to determine to what extent training in general science affects the interests and further achievement of pupils in physics and chemistry. The pupils who were used in the major portion of this investigation included 938 students who had graduated during the three previous years from the West High School of Rochester. These pupils were rather homogeneous with respect to race and general environmental factors. From a study and comparison of the examination results, the grades, and the sciences elected by the various groups, he arrived at the following tentative conclusions:

That students with general science preparation throughout the seventh, eighth, and ninth grades of the junior high schools do superior work in physics and chemistry to students with biology preparation.

That students with general science training become more interested in science, as evidenced by their election of science

courses in addition to the requirements and by superior grades.¹¹

It is during the junior- and senior-high-school period that the boys and girls are gathering a knowledge of natural phenomena, their meanings, interpretation, and inter-relations, and man's relations to them. These things must become a part of the individual's life experiences before specialized science will have any meaning for and so arouse more than superficial interest in the high-school pupil. If such concepts are developed thoroughly, the students of the senior-high-school age will not view science work as something very distasteful and as existing in some realm other than that of actual experiences. Such is the greatest psychological value of the junior high school as it relates to science; but seldom has it yet been found to bring the concrete science experiences together into a meaningful and related body of knowledge leading to a fuller understanding of the place of science in man's life and the relation of the different science materials to it.

Science teaching and transfer. Some of the values claimed for science teaching are accuracy of observation, organization, and expression, which it is supposed to develop. It is also sometimes stated that such habits, when developed in connection with science instruction, carry over or transfer to other fields. One eminent authority states this point as follows:

It does not indeed matter for the purpose we have now in view whether he seeks to make himself proficient in geology, or biology, or geometry, or mechanics, or even history or folklore, if these be studied scientifically. What is necessary is the *thorough* knowledge of some small group of facts, the recognition of their relationship to each other, and of the

¹¹ Carpenter, H. A., "Success in Physics and Chemistry in Relation to General Science and Biology," *Science Education*, 1930, Vol. 14, p. 599.

formulae or laws which express scientifically their sequences. It is in this manner that the mind becomes imbued with the scientific method freed from individual bias in the formation of its judgments—one of the conditions, as we have seen, for ideally good citizenship.¹²

If the individual is to be regarded as a unit in action and not as a mosaic composed of many separate faculties, there is every reason for believing that methods of work, principles, and generalizations developed in one situation may transfer to others. This is in harmony with the expressed judgments of a number of competent psychologists.¹³ There is also experimental evidence that training in discrimination, generalization, and application of learning may transfer.¹⁴ There is no reason, however, for thinking that transfer is automatic. The extent of transfer depends on the method of organizing and teaching subject matter. Ideals, attitudes, and habits of accuracy, high achievement, honesty, persistency, deliberateness, and the like, may be developed through a study of natural science. Their transfer depends on whether habits of generalization and of applying what is learned in one situation to problems in other situations are developed.

Provisions for individual differences in general science. Probably in no subject in the high school are there greater differences in ability between pupils than in the science courses. This is especially true in the general science course for two reasons. In the first place the science ex-

¹² From Pearson, Karl, *The Grammar of Science*, third ed., New York, The Macmillan Company, 1911, Part One, pp. 11-12.

¹³ Report, *Reorganization of Mathematics in Secondary Education*, the National Committee on Mathematical Requirements, 1923, pp. 89-96.

¹⁴ Coover, J. E., and Angell, F., "General Practice Effect of Special Exercise," *American Journal of Psychology*, 1907, Vol. 18, p. 328; Judd, C. H., "Practice and Its Effects on the Perception of Illusions," *Psychological Review*, 1902, Vol. IX, p. 27.

periences and interests of pupils cover a wide range. Some pupils entering high school have had considerable science training while others have had practically none. This applies to both content and methods of work. In the second place, the general science materials call for a wide range of abilities. Some general science content is very definite and concrete, while other parts may be highly abstract; some is mathematical and some is non-mathematical. Sex differences have been found in favor of the boys. Atkinson¹⁵ found from a study in the Pasadena Junior High School that 57 per cent of the boys equalled or excelled the median of the girls, although the girls were, on the average, slightly superior in intelligence.

If more than one general science course is running at the same time, pupils may be grouped somewhat according to interest and ability. In the average school, however, there is generally just one class. Here it becomes necessary for the teacher to provide as best he can for the wide range of interests and abilities represented in the group. Many teachers meet the problem of individual differences by setting the level of the teaching and learning at about the class average. In this case, the slower and weaker pupils are given extra time outside of class while the faster pupils are allowed to do extra work. The chief danger in this method lies in the recitation, which is likely to become for the faster pupils a bore and a place to spend their time in idleness. Also, the slower pupils are likely to fail to profit from the class hour and to develop undesirable attitudes toward science work in general.

The best way to meet the problem of individual differences is probably through much supervised study, indi-

¹⁵ Atkinson, C., "The Effect of Sex Differences in the Study of General Science," *Journal of Educational Research*, 1931, Vol. 24, pp. 61-66.

vidual consultation, and laboratory work. Maximum and minimum amounts of work may be assigned. The faster pupils may be requested to work up several units outside of class. Usually, if properly motivated, pupils take a great deal of pride in organizing a topic which is independent of classwork.

Measuring the results of general science instruction. The measurement of achievement in general science in the high school is difficult for at least three reasons. In the first place, teachers are not agreed on the purpose of general science. Some teachers regard general science as a "science course" the purpose of which is to give such materials as will be a foundation for more specialized courses in science. Other teachers are interested in the exploratory function of the course and have as their purpose of teaching a more general diffusion of knowledge aimed at the development of broad interests, aid in vocational selection, and the like. Some teachers are able to combine these two viewpoints successfully.

In the second place, the objectives of science teaching are, as usually stated, too general. Such objectives as: scientific attitudes, health, citizenship, worthy home membership, appreciation, and use of leisure time dominate the thinking of science teachers, while the work of the course consists in acquiring specific knowledges, working along the lines of definite plans, and so forth. The latter activities are capable of definite measurements, but, unfortunately, a large number of teachers are unable to set up specific objectives utilizing these activities.

A third fact which makes general science testing difficult is that there is little agreement concerning content. With well-trained and wide-awake science teachers, this is probably a condition to be desired, since it allows the

teachers to use materials found in the pupil's immediate environment and materials in which the pupil is interested. Poorly trained and otherwise inefficient teachers need a definite content and method in teaching.

It has been well established that frequent and accurate checking on pupil progress is conducive to good learning and study. The chief purpose of testing should be to improve teaching and learning conditions. Since the advent of educational tests, a number of tests have been developed in science designed to aid the teacher to evaluate the pupils' achievements, weaknesses, and general educational growth. In general, tests may be classified as traditional, new-type, and standardized. The traditional test is too well known to need further treatment. As learning exercises, some traditional examinations are undoubtedly of value. Their chief defect lies in the fact that they cannot be scored in an objective way. Different teachers assign widely different values to the same exercise of this type. The administration and use of standardized tests are discussed in Chapter XIX. Their values are well recognized. The new-type test of a matching or best-answer type can very well be used by the alert science teacher in measuring achievement, understanding, problem solving, or even attitudes in the subject.

Thought Problems

1. Distinguish between science as knowledge and science as method. Give illustrations of each. What is meant when a man is called a *scientist*? Is there a condition in which an English scholar might be called a scientist?
2. What is meant by the term *scientific method*? Have you read an account of a study which used this method? What other methods of study can you name?

3. How do you distinguish the physical from the biological sciences? How do you classify geography—as either or neither?

4. Do you think that the reading of so much nonfactual material in the elementary grades has any bearing on the difficulty of science teaching and learning in the later grades?

5. What interests that are universal in children may be used in teaching science?

6. How should the subject matter of high-school science be related to the activities of the community? Analyze the activities of the community which call for a knowledge of the natural sciences. What knowledge of science is of value to the electrician? The farmer? The housewife? The pharmacist?

7. Complete the following sentences:

a. The use of _____ is very important in the development of meanings in science.

b. Cause-and-effect relationships are never _____ directly by means of _____ alone.

c. In science the student should generalize and formulate _____ into laws.

d. Isolated experiences contribute _____ to one's education.

e. To solve a problem in science, one should first _____.

f. The scientific attitude should be made an _____.

g. Extensive reading _____ the development of the scientific attitudes.

h. People are not naturally scientific in their _____.

i. The degree to which ability to observe in general will transfer _____ depends upon _____.

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370 Psychology and the Natural Sciences

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CHAPTER XV

Psychology of Physics, Chemistry, and Biology

The physical sciences distinguished from the biological. The physical sciences usually offered in the high school are physics and chemistry. Because the sciences are somewhat grouped together here for purposes of convenience in treatment, it must not be supposed that they require exactly the same psychological processes. We find even the phenomena of the different branches of the physical sciences psychologically quite different when we consider their characteristics from the point of view of numerical relationship, concreteness, values for prediction, and openness to direct observation. Physics is largely mathematical and deals with materials and processes in the child's environment which are directly observable. Chemistry, on the other hand, is largely nonmathematical, and, while the materials with which it deals may be found in the child's immediate environment, its processes can be studied only in the laboratory. Chemistry is, therefore, essentially a laboratory subject.

The biological sciences are quite different in both subject matter and methods from the more exact physical sciences. They are not so exact as the physical sciences because they deal with materials which are much more complex and whose processes are not subject to such exact control. Biology in general deals with the phenomena connected with reproduction; growth, from the point of

view of both structure and function; origin and development of species; and adaptation to environment, both inherited and acquired. While the phenomena of the biological sciences may be analyzed, classified, and measured, yet the exactness found in the physical sciences may not be found here. Factors influencing organisms are so numerous and complicated that concerning organisms it is almost impossible to predict with the certainty usually found in the physical sciences. Variation is the rule rather than the exception in the organic world.

Besides these differences which are inherent in the nature of the subject matter, there are other differences which are brought to the subjects by the student. Students entering the physics class have certain notions concerning the subject matter of physics which they have acquired through experience with machines of various kinds. The same is true with chemistry, except to a lesser degree. Cause and effect, force, energy, elements, and the like, are psychological concepts at least partially developed in the physical science class. All these concepts carry a meaning of regularity, of exactness, and of law. This is not true of the concepts developed from prescientific experiences in the biological environment of the pupil. He definitely brings to the biological studies a vitalistic concept of life. The different psychological concepts are what the science teacher must start with. It is important that the teacher recognize the difference between the student's mental approach to the physical sciences and his approach to the biological sciences.

A. Physics

The pupil and physics. Every physics teacher may regard himself in relation to his teaching in one of three

ways: as a teacher of students, as a teacher of physics, or as both. As a matter of fact, he is, at least partially, all of these in each. In some cases, he knows so little about his pupils and how they grow that he may be regarded as a teacher of physics. There are other cases, much more rare, however, where the teacher loses sight of the fact that physics has made a place for itself in the curriculum because it does possess a body of content of great functional value in the orderly development of the pupil. With students just beginning a study of physics, it is important for the teacher to feel first of all that he is a teacher of students and that his duty is, not to bring physics down to them, but rather to take them as they are, and, with their present knowledges, interests, and abilities, lead them on to the definite objectives of the course.

Physics deals with material bodies and with such changes as involve motion. A study of physics is thus concerned with matter, energy, and forces. From early life, knowledges and interests about things in our environment are acquired. It is very difficult for us at maturity to look back and analyze how or in what situation we secured many of the meanings and interests on which the actions of our daily lives are built. Before the child is a year old, it learns that objects fall and that they can be thrown a certain distance. Size and weight are notions that begin to develop early. In the environment of every child, machinery plays a prominent part. The child in the home comes in contact with washing and sewing machines, phonographs, telephones, radios, vacuum cleaners, and the like. The city or country child may come in contact with a wide variety of mechanical appliances used outside the home, such as: automobiles; wagons; elevators; locomotives; ships; tractors; mowers; reapers;

pumps of various kinds; water, wind, or steam power plants; and many others. Knowledge about these things is being acquired almost unconsciously all the time, so that, by the time the student reaches the high school, he has acquired a vast amount of information which is directly related to physics.

It is with this information which the child brings to school that the physics teacher must start. The type of physics taught in high school does not seek so much to add to the stock of knowledge already possessed by the average pupil as to enrich and refine that already possessed.

There is nothing in literature more wonderful or more inspiring than observable facts of nature, but the pupil must be able to see and interpret if he is to appreciate them. The teacher must not fail to realize that he is teaching boys and girls, and that the measure of his success must be found in terms of pupil growth and, ultimately, human values. This is the philosophy that is fast coming to be recognized as a part of our future social order.

Factors contributing to success or failure in physics. In the teaching of physics, the situation at the beginning of the course is very different from what it is in many of the other sciences. There are few topics taken up in the course with which the pupil is not already partially familiar. Even the technical vocabulary of the subject is in part already in use by the pupils. It would seem that, since physics deals with the things immediately about the pupil, it would be easier to teach successfully than almost any other one of the high-school subjects. The ease or difficulty of a subject depends, however, upon many factors in addition to familiarity. Some of the problems of physics teaching are discussed in the following paragraphs.

a. *Intellectual demands of physics.* A number of

studies have been made as to the relation between mental ability and achievement in physics. These in the main have found rather low correlations between the two. The reason for this finding probably lies in the fact that high-school testing is in its infancy and that measures of achievement in physics are highly unreliable. In a study of laboratory resourcefulness and intelligence, Beauchamp and Webb¹ found a correlation of .57 between the *Otis Self-Administering Test of Mental Ability* and their tests of laboratory resourcefulness, and one of .44 between their tests and the *Yerkes-Bridges-Hardwick Point Scale for Measuring Mental Ability*. When the *Terman Group Tests of Mental Ability* and certain physics tests were given to 81 eleventh-grade pupils of the Peabody Demonstration School, the following correlations were obtained: ²

<i>Terman and Thurston Physics</i>.....	.47
<i>Terman and Hughes Physics</i> .....	.68
<i>Terman and Iowa Physics</i> .....	.62

It will be noticed that achievement in physics is only moderately correlated with intelligence test scores. However, the probable unreliability of our present physics tests and the fact that high-school pupils offer a rather narrow sampling of mental ability must be kept in mind.

In another investigation, Hurd³ studied the problem of prognosis in physics learning. A correlation of .76 was found between new-type physics test and intelligence test scores. A closer relationship was found between two

¹ Beauchamp, R. O., and Webb, H. A., "Resourcefulness, an Unmeasured Ability," *School Science and Mathematics*, 1927, Vol. 27, pp. 457-465.

² Garrison, S. C., unpublished materials, Jesup Psychological Laboratory, George Peabody College for Teachers, Nashville, Tenn.

³ Hurd, A. W., "The Intelligence Quotient as a Prognosis of Success in Physics," *School Review*, 1926, Vol. 34, pp. 123-128.

physics tests. After analyzing his scores and setting certain standards of attainment, Hurd came to the conclusion that only one pupil out of four with an intelligence quotient of 108 could reach the level set. He therefore raised the question as to who should study physics.

The degree of difficulty presented by physics in comparison with that presented by other subjects was studied by Terman and Willoughby,⁴ who had each of 48 school subjects rated by 25 competent judges. Physics and chemistry tied for first place in point of difficulty. It is interesting to note that in a study of the preferences of gifted high-school pupils for the school subjects, 58 per cent liked physics "very much" as compared to 1 per cent disliking the subject "very much." When the subjects were rated by the gifted pupils as to difficulty, 29 per cent rated physics as very easy.

b. *Interest in physics.* Interest is one of the major factors determining success or failure in physics. Goss investigated 100 failures in physics by means of an unsigned questionnaire. The results of the study are summarized with respect to interest as follows:

Among the many causes bringing about the failure of the 100 students investigated, interest is an outstanding factor. From the beginning of the term, the interest of some of these students was not aroused because they thought the subject difficult; they had no purpose in studying physics; they did not develop a liking for the subject, or an intrinsic interest in it. The majority of failures admit letting their attention wander from the subject because of lack of interest. Therefore, the absence of interest as the driving force is a cause of failure.⁵

⁴ Terman, L. M., and Willoughby, R. L., *Genetic Studies of Genius*, Palo Alto, Cal., Stanford University Press, 1925, Vol. I, Chap. XIX.

⁵ From Goss, Mildred J., *Contributions to Education*, Vol. II, Chap. XVI. Copyright 1928 by the World Book Company, Yonkers-on-Hudson, N. Y.

Results similar to those of Goss were found by Burgess, who constructed a battery of tests to measure and analyze the psychological abilities in high-school physics. Based on zero correlations, the following factors contributed to physics ability in the order named: "first, interest in physics; second, simple mathematics of physics; third, number series and logic (reasoning); fourth, reading comprehension; and fifth, observation aptitude."⁶

The indications are that interest plays a very large part in the success or failure of the student in physics. The student comes to the physics class interested in the things about him, but he has developed inaccurate concepts for many physics facts. It takes unusually good teaching skill to build on such concepts without at the same time making the work drudgery.

c. *Language and physics.* There are practically no quantitative studies of the relation between such language abilities as reading, spelling, vocabulary, writing, and composition and ability in physics. Such relationship as is found is probably due to the underlying factor of general intelligence. It must be remembered that most language teaching in the grades and in the junior high school is of the kind which has grammatical correctness, literary expression, and appreciation for its aims. Children are encouraged to be original, and this often means that they are encouraged to get as far from real, definite situations as possible. They are told to draw on their imaginations, and no distinction is made between fancy and productive imagination.

This situation in language teaching makes the problem of teaching in both the social and the natural sciences

⁶ Burgess, T. O., "A Psychological Analysis of Abilities in High School Physics," *University of Iowa Studies in Education*, 1926, Vol. III, No. 6.

more difficult. Physics shares with the other sciences the difficult problem of securing exact expression. One of the first problems in the psychology of physics teaching is what concepts it is necessary to build up in the physics classroom. A concept can generally best be thought of as a word around which a group of meanings may be clustered. Most of the concepts used in physics have been built up through careful measurement of three qualities: length, mass, and time. The student brings to class words which have definite meaning to the physics teacher, but these do not have for the student the precise meaning which they have for the teacher. One of the first problems of the physics teacher is to give more accurate meanings to words which the pupil already has.

The vocabulary of physics has been studied by a number of workers.⁷ Pressey through a study of widely used texts selected a list of 1,040 technical terms in physics. The difficulty which children have in studying physics is frequently a meaning difficulty. With inadequate experience, it is difficult to secure the meaning of a technical word from its context in a sentence. Especially is this true when the sentence has several technical terms in it.

The technical terms used in a science are more than a mere list of words. These terms represent the concepts which children are supposed to develop. The teaching of such words, therefore, becomes an important problem. During his life the individual constantly modifies through further experience the meanings which he has built up. In physics the problem resolves itself into one of how certain notions, meanings, or concepts may best be de-

⁷ See: Pressey, L. C., "The Determination of the Technical Vocabulary of School Subjects," *School and Society*, 1924, Vol. 20, pp. 91-96; and Powers, S. R., "The Vocabulary of High School Text-Books," *Teachers College Record*, 1925, Vol. 26, pp. 268-282.

veloped. There must always be some vehicle, some word or group of words, to which these ideas or meanings may be attached and which can be used in thinking about the physics situation. Meanings may be built up through reading and class discussion, but it is very questionable whether ideas secured in this way ever have the same functional value as those derived from experiences with actual things where the pupil measures and tests relations and results. Reading and class discussion alone lead to mere verbalism.

Lists of technical words are important in the hands of the teacher if used as a kind of checkup. Their chief value lies in the fact that by means of them the teacher may know the words carrying much meaning for physics and may see that the pupil secures such experiences from contact with laboratory exercises as will give proper meanings to these words. Their use in the hands of students for the purpose of definition-learning apart from actual experiences with things is of questionable value.

d. *High-school physics and success in college physics.* Several studies have been made of the value of high-school physics as it is now taught for those who will continue physics in college as it is taught there. Crudup⁸ studied the records of 906 college students who took one year of college physics. Approximately half of these students had taken a course in high-school physics. His data he treated in several ways. Holding mental ability constant, he found practically no difference between the two groups. Those who had taken high-school physics were slightly inferior, on the average, to the non-physics group.

⁸ Crudup, J., "A Comparison of Grades in College Physics," unpublished master's thesis, George Peabody College for Teachers, Nashville, Tenn., 1928.

Harvey offers an interesting comment which may explain the above findings of Crudup and the statement so frequently attributed to college teachers of physics, that they prefer that their students should not have had high-school physics:

Laboratory work gives ideas that are more vivid and clear, if the work is well taught, than can be obtained by the study of a textbook or by lectures. The reason for this is apparent if we realize that the several sensations that enter into a percept, or its reproduction as an idea, are the concomitants of strong, peripherally initiated impulses; while the sensations that constitute the ideas derived from the study of books, or from lectures heard, are accompanied by only weaker, centrally initiated impulses. This is one way of accounting for the differences in the clearness and vividness of the percepts we get from laboratory work, as contrasted with those we obtain from book study. . . .

It was once my custom in teaching physics in a normal school to divide the students into two classes, those who had had physics in high school in one class, and those who had had no physics in the other. In three separate years, in a carefully conducted experiment leading to the formulation of the laws of uniformly accelerated motion and the measurement of g , where each pupil derived his own data and the results were computed from the average of the entire class, I found that, in all three of the years, the class that had not previously studied physics obtained more nearly accurate data and computed a result more nearly in accordance with the facts than did the class that had studied physics in high school. Those who had studied physics in high school had used a textbook, and the laboratory work had been rather incidental. The two methods seem to be incompatible, and will not very satisfactorily mix.⁹

Measuring the results of physics teaching. The problem of measurement in physics is similar to the problem in other high-school subjects. There is such a wide

⁹ Harvey, M. A., "The Psychology of Laboratory Science," *School Science and Mathematics*, 1932, Vol. 22, pp. 535-541.

diversity both in content of subject matter and in aims and methods of teaching that nobody seems to know just what the teacher should accomplish. However, a number of workers are attempting to arrive at a more scientific solution of the problem of content. That the results of teaching are unsatisfactory is indicated by such studies as that of Miller,¹⁰ who attempted to determine the extent to which the pupils in 28 public schools of one State had acquired the common facts and information required in an elementary course in physics.

TABLE LI

THE PERCENTILE RANK, THE GRADE OF ABILITY, AND THE CORRESPONDING SCORE OF PERCENTILE RANK OF THE 600 STUDENTS WHO WERE TESTED ON THE FACTS OF PHYSICS.
(After Miller.)

<i>Descriptive Designation of Level of Ability</i>	<i>Percentile Rank</i>	<i>Quantitative Designation of Ability</i>	<i>Corresponding Score of Percentile Rank</i>
Highest.....	{ 94.5	9.0	30.9
	{ 91.9	8.5	30.2
Very High.....	{ 88.5	8.0	29.4
	{ 84.1	7.5	28.4
High.....	{ 78.8	7.0	27.8
	{ 72.5	6.5	26.8
Medium High.....	{ 66.5	6.0	25.5
	{ 57.9	5.5	24.3
Medium.....	{ 50.0	5.0	23.3
	{ 42.1	4.5	22.5
Medium Low.....	{ 34.5	4.0	20.6
	{ 27.5	3.5	18.0
Low.....	{ 21.2	3.0	17.25
	{ 15.9	2.5	15.6
Very Low.....	{ 11.5	2.0	14.4
	{ 8.1	1.5	13.3
Lowest.....	5.5	1.0	12.1

In the investigation referred to above, Miller constructed tests on heat and mechanics. These were criti-

¹⁰ Miller, P. S., "A Quantitative Investigation of the Efficiency of Instruction in High School Physics," *Journal of Educational Research*, 1929, Vol. 19, pp. 119-127.

cized by a number of teachers and then modified after a preliminary trial in three high schools. The conclusions from this study indicate "that the pupils in the public high schools in which the investigation was conducted have not acquired the facts of physics."¹¹

In Table LI the data from Miller's study are presented in percentile form to show the wide range in ability which is found when the results of physics teaching and learning are measured. There were a total of 37 questions in the test, and the test was taken by 600 pupils. An examination of the table shows a wide range of scores. Evidently some pupils scored no higher than the average high-school pupil would score without any physics instruction.

B. Chemistry

The psychology of chemistry teaching is somewhat different from that of physics teaching. Physics deals with changes in the physical properties of matter. These changes usually do not alter the substance in any way and are readily observed. Chemistry, on the other hand, deals with changes in matter which are not readily observable. In order that chemical changes may be investigated, they must be produced artificially. Again, chemical changes deal with changes in the functioning of atoms and molecules, units so small that they cannot be observed directly by the senses. The functioning of such units can be known only through inference and comparison with data already established.

The pupil and chemistry. It will be seen from an examination of the data and processes employed that chemistry requires a type of experience different from that

¹¹ *Ibid.*, p. 129.

employed in physics. Learning in physics is but a continuation of experiences which are conspicuous in everyday life. As was stated before, the work in high-school physics is largely a problem of refining and giving more accurate and exact meanings to concepts already established. In chemical changes, the entire material undergoes a complete transformation. Moreover, the process during the change is not readily observable. Because of these facts, chemistry, while requiring less numerical work, is more abstract than physics.

Because of its nature, chemistry requires very accurate thinking. Instead of being able to start from the pupils' immediate environment, the teacher must, from the very beginning, use the laboratory method. To go from processes seen in the laboratory, which must be checked with existing data and stated principles, to generalizations about classes of things requires the highest type of productive imagination. Because of its abstractness and its demand for logical thinking, chemistry is a subject which requires a relatively high degree of maturity on the part of the student.

Reference to the place of chemistry in the high-school curriculum shows that it is more and more being given in the last year of high-school work. This is probably as it should be, since it is the most abstract of the sciences usually offered in high school. It shares with physics the distinction of having been rated as one of the two most difficult subjects in the curriculum.¹²

By the time the pupil reaches the last year of high school, he has practically reached mental maturity. This does not mean, however, that it is easy for him to do

¹² Terman, L. M., and Willoughby, R. L., *Genetic Studies of Genius*, Palo Alto, Cal., Stanford University Press, 1925, Vol. I, Chap. XIX.

abstract thinking or to grasp scientific principles. In a large measure, his previous experiences are of a sort just opposite to those which are desirable for the development of scientific methods of thinking and scientific attitudes toward natural phenomena. Many forces in the environment of the average adolescent are such as to encourage him to accept things as they are and to discourage him if he should question the "why" and "how" of things. His training has been not only largely of an unscientific kind, but under circumstances in which exact thinking is difficult.

Objectives of chemistry. Pupil development is not a hit-or-miss affair. Definite principles and laws operate in the growth and development of the individual as they do elsewhere in nature. Here, however, there are many factors operating, and none of them are under as definite control as are those in some other spheres. It must be remembered always that the materials of the curriculum do not exist for their own sakes, that their only value lies in the fact that they may be used in enlarging and enriching the pupil's world and in aiding him to control the natural processes of the world.

A subject, to be worthy of a place in the curriculum, should have both immediate and ultimate values. The immediate aims of a subject should be evaluated in terms of what the subject offers to the pupil while he is studying it—how it changes, motivates, and enriches his reactions to the things of the world about him. The ultimate aims of a subject are to be considered with regard to their value for permanent attitudes, points of view, and harmonious integration of the total life of the individual, and their value for vocational success.

The human value of chemistry, as of all the other

sciences, is great. Some years ago, Thomson made the following comment:

A nation thoroughly trained in scientific method and stirred with an enthusiasm for penetrating and understanding the secrets of nature would no doubt reap a rich material harvest of comfort and prosperity, but its truest reward would be that it would be fitted by an ample and generous education to perform justly, skillfully, and magnanimously the offices both private and public of peace and war.¹³

The ultimate outcome of chemistry teaching and learning is stated by Gerry¹⁴ in the following manner: "(1) An improved state of individual and community health, (2) an ability to perform many of the services that make an individual a worthy member of a family, (3) a preparation and a guidance so that each may select his vocation wisely, (4) an increased respect for the expert and his services to society to the end that each may act well his part as a member thereof, (5) a genuine appreciation of nature so that one's leisure hours may be worthily used, and (6) an exaltation of truth in the development of ethical character."

Problems in the teaching and learning of chemistry. An important problem that relates to teaching and learning is whether pupils acquire the materials taught. There have been a number of studies made concerning pupils' errors in chemistry. The results of one such study made by Stewart¹⁵ are summarized below. This study was

¹³ Thomson, Sir J. J., "Natural Science Teaching in Great Britain," *Bulletin No. 63*, Bureau of Education, Department of the Interior, 1919, p. 9.

¹⁴ Gerry, H. L., "Some of the Factors Determining the Common Content of High School Chemistry," *School Science and Mathematics*, 1924, Vol. 24, pp. 457-466.

¹⁵ Stewart, A. R., "A Study of Difficulties in Chemistry," *School Science and Mathematics*, 1928, Vol. 28, pp. 838-848.

made by means of giving new-type tests and questionnaires to the students.

Question No. 1. What have been the most difficult parts of chemistry?

The responses at the end of the first semester are in column No. 1, and the responses at the end of the year in column No. 2.

	No. 1	No. 2
Equations.....	33	26
Valence.....	24	8
Problems.....	14	18
Formulas.....	14	8
Dissociation.....	5	0
Atomic theory.....	3	2
Solutions.....	2	0
Organic chapter.....	0	7
Colloids.....	0	5
Theoretical parts.....	0	3
Properties of elements.....	1	2
Separation of elements from compounds..	0	3

A number of other parts received mention one time.

Question No. 2. How could the difficult parts have been overcome, or were they naturally difficult?

More study.....	29
Naturally difficult.....	28
No part too difficult.....	4
By repeating "over and over".....	4
By regular attendance.....	3
Disliked mathematical parts.....	3

Question No. 3. What have been the most interesting parts of chemistry this semester?

	1st Semester	2nd Semester
Laboratory work.....	38	46
Study of elements.....	9	8
Study of sulphur.....	9	0
Demonstrations.....	—	3
Writing equations.....	4	1
Study of oxygen.....	3	0
Study of sodium and potassium....	2	0
Properties of elements.....	2	2
Finding "unknown".....	—	3
Outside reports by students.....	—	3
Study of iron.....	—	3

Another study which shows the effects of intelligence on learning was made by Wolf,¹⁶ who desired to determine how accurately one could predict the success of a pupil in the study of chemistry solely on the basis of an intelligence test. The results of this study are summarized in Table LII.

There are several causes for the wide differences in attainment in chemistry. Studies show that both native ability and different types of teaching undoubtedly are

TABLE LII

PERCENTAGES OF PUPILS GROUPED IN QUARTILE RANGES OF THE TERMAN GROUP TEST WHO RECEIVED MEDIAN SCORES OR OVER IN THE VARIOUS TESTS. (*After Wolf.*)

<i>Terman Group (ranges)</i>	<i>Powers</i>	<i>Rich</i>	<i>Instructors</i>	<i>Regents</i>	<i>Composite</i>
88-151 (50) ¹ ...	30%	14%	52% ²	42%	36% ²
152-171 (46)....	54%	48%	44%	44%	43%
172-187 (48)....	50%	56%	52%	52%	52%
188-212 (45)....	76%	76%	69%	69%	76%

¹ Numbers in parentheses indicate the number of pupils in the range.

² "Instructors" and "Composite" percentages represent pupils whose quantitative equivalents were 50 or above.

partly responsible for this condition. Rich¹⁷ found that pupils when they first come to study chemistry may know practically nothing about the subject, or, if test scores may be used as an indication, they may know more than some students who have had a year of training in the subject. Undoubtedly there are interest and environmental factors which are highly important for success in chemistry. It would seem that the first duty of the teacher of chemistry

¹⁶ Wolf, M. G., "The Relation between the Degree of Intelligence and Success in the Study of Chemistry," *Journal of Chemical Education*, 1928, Vol. V, pp. 76-83.

¹⁷ Rich, S. G., "What Do Pupils Know of Chemistry When They Begin to Study It?" *Journal of Chemical Education*, 1925, Vol. II, pp. 659-666.

is to make an inventory of the abilities and knowledges possessed by the student when he enters the class.

Mental processes required in chemistry teaching. One of the first problems that the teacher of chemistry meets is how to use the interests of his pupils. The work of any course should be closely related to the previous experiences and interests of the student, but at the same time the aims of instruction must be considered. Nowhere, probably, does the genuine teacher have greater opportunities and responsibilities for student guidance. Student interests discovered at the beginning of the course must be considered; but, if these do not lead toward the goal for this particular group of students, new interests must be developed.

In addition to the interests, there are certain notions which have been acquired. In the first place, the average person knows little about chemistry because it is largely a laboratory subject. This fact may lead to a mental attitude toward chemistry which considers it something mysterious and bordering on the occult. In the second place, the little known by the average student concerning chemistry has to do with chemicals as explosives or as causing fires. This circumstance may lead to vague fears about work in the laboratory. To counteract such notions regarding the study of chemistry, it is probably best to use things which are familiar and not at all dangerous or spectacular.

Mental processes required in studying chemistry. Chemistry, as it is generally taught, is an abstract study. Most texts start with something in the pupil's immediate environment but something which he is unable to observe except under laboratory conditions. Because of its abstractness, the study of chemistry is likely to become a

matter of mere memory. While there are certain fundamental principles and laws which must be learned, the student should be made to realize from the very beginning of the course that emphasis is to be put on understanding, organizing, and thinking, and not on mere memory work.

The learning of chemistry—even to a greater extent than the learning of physics—depends on symbols. One important problem relates to the acquisition of meanings for the symbols which are used to express chemical facts and processes. Such meanings are acquired either through actual contact with processes in the laboratory or through reading about them. It takes considerable skill on the part of the teacher to co-ordinate these two methods of acquiring meanings. In the laboratory, actual things are observed and knowledge is gained at first hand. Meanings are acquired from language context simply because the language already carries certain meanings. In this method the new is, thus, described in terms of the old, which in many cases in science is inaccurate.

If we assume that the mastery of symbols is essential for progress in chemistry, then such mastery becomes one of the problems of chemistry teaching and learning. From what we know about vocabulary growth, we are safe in assuming that experiences with concrete materials are essential in the development of symbolism. The individual must be instructed in such a way that he is not suddenly thrust into the abstract. Most of the fundamental concepts of chemistry must be given to the student through both the lengthy verbal description necessary for their understanding and the symbols which may be used to stand for the more elaborate description. Gradually, the student abbreviates his lengthy verbal reactions in thinking to more direct ones through the use of symbols. Most

of the difficulty experienced with symbols arises from the fact that not enough time was devoted to developing meanings for them.

If the student early learns that chemistry is a study of the changes in the substances of things, and that these changes occur according to certain fundamental laws and principles, he is on the right track for the development of good study habits. Chemistry is one of the most easily motivated subjects for the simple reason that its usefulness in life is apparent. Again, its definiteness makes accurate checking on the part of the teacher for the purpose of showing pupil progress easy.

TABLE LIII

DISTRIBUTION OF MENTAL PROCESSES REQUIRED IN THE VARIOUS EXAMINATIONS. (*After Rich.*)

	<i>Number of Responses</i>	<i>Per Cent of all Responses</i>
A. Verbal memory for names and definitions.....	245	17.1
B. Verbal memory for symbols and formulas.....	163	11.4
C. Verbal memory for laws and theories.....	59	4.1
D. Memory for laboratory work done.....	192	13.4
E. Memory for commercial uses, properties, etc...	284	19.7
F. Memory for other facts.....	133	9.7
G. Equations to be written or completed.....	216	15.1
H. Thinking other than equations or computations	43	3.0
I. Computations.....	96	6.7
Totals.....	1,431	

Regardless of the fact that chemistry may require a high type of thinking and productive imagination, many teachers and examiners see chemistry only as a subject to be memorized. Rich's¹⁸ study shows this to be especially true of college examination committees. He studied the examination questions asked by the College Entrance

¹⁸ Rich, S. G., "Mental Processes Required in Examinations in Chemistry," *Journal of Chemical Education*, 1926, Vol. III, pp. 445-449.

Examination Board and the Regents in New York State. The mental processes required in the various examination questions were analyzed and tabulated. His data are summarized in a modified form in Table LIII. Memory processes are the chief ones measured by the examinations. The situation would not be so bad if the questions had no influence on teaching, but we may be sure that teachers whose pupils plan to take such examinations are influenced by them in their teaching.

Sources of difficulties. The two factors responsible for most errors of high-school students in chemistry are: (1) insufficient drill, and, thus, a failure to provide for the overlearning of some of the fundamental facts; and (2) formalism in the teaching process. In the case of insufficient drill is to be noted the fact that in an ordinary textbook of chemistry there are to be found a very large number of words, principles, and formulas outside the student's environmental experiences. In a great number of cases, these words, principles, and formulas are encountered only once in the text. The student may therefore recognize the words, and so forth, in the setting in which each is presented in the text; but, as the course progresses and more words, formulas, and so forth, are encountered in the same manner, soon a great number of principles, words, and formulas have been experienced in a vague manner without becoming a real part of the student's experience. These words and formulas are not encountered again, and are thus soon forgotten, just as all materials that are not made a part of the student's life experiences are of little value to him in future uses and applications. This fact is probably the most significant element to be considered in a study of the findings in regard to the value of high-school chemistry for further

chemistry work in college. Drill and meaningful presentation of the materials would aid in clearing up this difficulty. Too often textbooks are encyclopædic in nature, and the content of such texts cannot long be remembered. It has already been pointed out that there is little knowledge possessed by the students upon entering school that relates directly to chemistry. There are a great number of universal experiences that relate indirectly to the content of chemistry. Such experiences, for example, those found in *the purifying of water, the kindling of fires, the elements of bread*, and so forth, can be utilized in the elementary stages of the teaching of chemistry.

Measuring the results of chemistry teaching. Before one can very intelligently outline a testing program for the purpose of measuring the achievement in chemistry, it is necessary to have a clear conception of (a) the content which has been taught, (b) the methods which have been used, and (c) the purposes or aims for which teaching was done. Historically, chemistry as a subject was first taught in the colleges. Through several influences it entered the secondary course of study. The academies were established to meet the need for a training broader than that provided by the classical school. The founders of the academies desired to prepare students not only for college but also for life. It was thought that chemistry would make a large contribution to this end.

Again, the academy teachers were graduates of the colleges and, naturally, taught the subjects in which they were most interested. Consequently, the materials, methods, and aims of teaching were largely those of the college. From time to time chemistry teaching has been modified and new methods and aims introduced. There

is, however, at present very wide variation in content, as is shown by several investigations.¹⁹

General science, biology, physics, and chemistry are the four sciences usually taught in high school. Of these, chemistry probably affords the best field of testing. During recent years, more work has been done toward developing reliable tests in chemistry than in any of the other science fields. The construction of reliable chemistry tests involves the following: (a) the selection of test items which sample accurately the content of chemistry; (b) the administration of these sample test items to pupils and the elimination of faulty ones, those that are ambiguous, and so forth; (c) the evaluation and arrangement of acceptable items in a test or scale; and (d) the development of norms. There are several other bits of information which should be, but usually are not, furnished by test makers. It is desirable to know how much the pupil's score may be expected to improve on a second testing as a result of his familiarity with test procedure. It is also desirable to know the reliability of the test, that is, whether the results secured at a second testing may be expected to be similar to those secured at the first testing.

Tests in chemistry are constructed for the same purposes as are those in the other subjects. Chemistry tests have not been constructed for all the purposes enumerated below, but eventually we may expect to have tests which:

1. Measure the amount of progress of pupils and of classes at definite intervals of instruction.
2. Aim at diagnosing pupil difficulties.

¹⁹ Gerry, H. L., "Some of the Factors Determining the Common Content of High School Chemistry," *School Science and Mathematics*, 1924, Vol. 24, pp. 457-466.

3. May be used for purposes of predicting pupil success or failure.
4. Aid in evaluating different methods of teaching.
5. Aid in determining parts of the course which are too easy or too difficult.
6. May be used for determining the relationship of achievement in chemistry to achievement in other school subjects.

C. Biology

The importance of the biological sciences in modern life can be estimated. Discoveries in the physical sciences have probably played a greater economic role than those in the biological in many ways; however, the contributions of the biological sciences have to no small degree made possible modern trade and industry. The development of such a project as the Panama Canal was possible only because man was able to control the physical and biological factors of his environment. The history of civilization is an account of man's attempt, either individually or collectively, to control the physical or biological factors of his environment.

Not only is biology important as an approach to economic problems, but biological interpretations may be given to almost every phase of the world's activities. If we desire to know how modern biological discoveries have influenced the thought of the world, we need only attempt to understand how man looked at the world a brief time ago and contrast his views at that time with those that he holds today.

Contributions of biology. The purpose of all education is to condition the individual toward his environment in a desirable way. We realize that in this way we build

up the world for each individual. The worth of a subject is to be judged by what it contributes to the life of the individual and, through the individual, to the community. Because all values must be interpreted in terms of human values, and these are biological, it can safely be stated that the biological studies are among the most important. The world is filled with living things. Our interests are concerned largely with relationships between living things. Not only do we place a biological interpretation on practically all, if not all, the events of the world, but much of the content of our thinking is biological.

The major contributions which the biological sciences have made to man's progress, according to Downing, may be classed as:

I. New skills based on a knowledge of biological laws and principles—such as skill in healthful living, skill in producing better plants and animals to serve man's needs.

II. New emotional standards, ideals, and tastes that have been engendered by the self-sacrificing devotion of scientists, by new appreciations of the significance of the biological environment.

III. That attitude of mind we call scientific, for which not biology alone, but all science is in large measure responsible, but to which biology has made stirring contributions in the work of such men as Jenner, Lister, Koch, Pasteur, Mason, Reed, and a host of others.²⁰

A further analysis of the contributions which the biological sciences make to the life of the individual and the race shows that they touch man's activities at every point. Some of the ways in which they have influenced our thinking and our attitudes toward life may be mentioned as follows:

1. With regard to the nature and control of diseases.

²⁰ Downing, E. R., "The Biology Course Outlined in Major Objectives," *School Science and Mathematics*, 1928, Vol. 28, pp. 497-505.

2. With regard to the control of pests—especially as they affect health and economic life.

3. In the proper selection of foods.

4. With regard to the relation of animal and plant worlds to each other and to various factors, such as climate.

5. In the appreciation of the orderliness of nature—that cause and effect apply universally, that plants and animals are so wonderfully adjusted to their environment.

6. With regard to the relation of offspring to parent. This has opened up a new world in plant and animal breeding and promises to have a profound influence on man himself.

7. With regard to the physical and mental influence of environment on man.

8. In the appreciation for the work of others and the sacrifices which many workers have made in advancing our knowledge of how to control diseases, pests, and the like.

9. In the interpretation of history, philosophy, language, and so forth.

10. In the focusing of religious effort on human betterment, physical, mental, and social, rather than on various kinds of taboos, mystical rites, and the like.

Objectives of biological teaching. If we were able to state definitely and concretely just what desirable attitudes and skills a subject, if properly taught, might develop in the student, we should have a good starting point for stating the aims of the subject. Unfortunately, this cannot be done yet with any degree of assurance. The "Seven Cardinal Principles of Education" have had such a profound influence on educational procedure that teachers and leaders in a particular field think that the aims for a subject must somehow be stated in terms of these prin-

ciples. The main question to be asked concerning any school subject is, What does it do for the pupil in comparison to what other subjects do? It would be admitted by everyone, we believe, that all subjects are not of equal value for all students or even for a majority of students.

The aims of biology teaching must be sought in the nature of its subject matter and in the character of the responses which the individual is able to build up because of the nature of its subject matter.

A number of workers have attempted to determine through questionnaire studies what the aims of biology as a school subject should be. Reusser²¹ asked a large number of teachers to rate a number of stated aims. The aims receiving the highest ratings were:

1. To broaden the pupil's knowledge of his own body through the study of the structure and function of other animals and plants.
2. To make the pupil a good citizen through his knowledge of good food, good health, and good living conditions.
3. To train pupils to make accurate observation.
4. To train pupils to think calmly and to form logical conclusions based on facts.
5. To develop interest in the life of the environment by giving first-hand information on plants and animals.

Walter states that there are at least three important reasons for studying biology. These are:

1. To gain control of the forces of nature—the practical aspect.
2. To learn a body of organized facts about living things.
3. To practice the scientific method of thinking.²²

²¹ Reusser, W. C., "The Status of General Biology in High Schools of the North Central States," *School Science and Mathematics*, 1923, Vol. 23, pp. 258-261.

²² Walter, H. E., "Teaching Biology in the Secondary Schools," *School and Society*, Jan. 25, 1930, Vol. 31.

Content of high-school biology. The content of biology is of importance because the type of habits, skills, and attitudes developed depends in part on the materials out of which they may grow. There are a number of factors which must be considered in the selection of the subject matter of high-school biology. These may be enumerated in the following way:

1. The topics should be similar to, if not identical with, those in which children are already interested and in which they have had experiences.

2. The subject matter of high-school biology should be largely selected from the child's immediate environment.

3. Topics should be selected and arranged according to the maturity of the pupil in point of both educational achievement and mental ability.

4. Topics should be selected in harmony with the aims of education. Since through education we are attempting to guide the development of pupil behavior and mental content, and since the aims of biology teaching state what we hope the end-product will be, it is necessary that we select for teaching purposes materials which are in harmony with the desired results.

5. One of the major aims of biology teaching is concerned with the health of the pupil and the community. Special attention should be given to the selection of topics appropriate to the development of personal health and of points of view regarding community needs.

From a study of five large classes in zoology at the University of Minnesota, Cederstrom concluded, "Students who have had a previous elementary course in zoology in high school have a pronounced lead over the

others at the beginning of the course, but as the college course progresses this lead is reduced.”²³

Relation between mental ability and achievement in biology. In the teaching of any subject it is highly desirable to know just what relationship exists between achievement in the subject and a number of other factors. Unfortunately, very few scientific investigations have been made along this line in the high-school field. Several

TABLE LIV

COEFFICIENTS OF CORRELATION BETWEEN CERTAIN BIOLOGY TESTS AND THE “THORNDIKE-McCALL READING TEST” AND THE “OTIS SELF-ADMINISTERING TEST OF MENTAL ABILITY.”
(After Berry.)

Otis S.-A. with:

<i>Ruch-Cossman</i> (given at the first of the year).....	.41
<i>Ruch-Cossman</i> (given at the end of the year).....	.64
<i>Cooprider</i> (given at the first of the year).....	.17
<i>Cooprider</i> (given at the end of the year).....	.53

Thorndike-McCall with:

<i>Ruch-Cossman</i> (given at the first of the year).....	.36
<i>Ruch-Cossman</i> (given at the end of the year).....	.18
<i>Cooprider</i> (given at the first of the year).....	.34
<i>Cooprider</i> (given at the end of the year).....	.39

reasons why it is difficult to make such studies have previously been discussed. Coefficients of correlation between certain test scores are given in Table LIV. The data in the table are taken from Berry,²⁴ who studied the relationship between mental ability as measured by the

²³ Cederstrom, J. A., “The Influence of a Secondary Course in Zoology upon Gains in College Zoology,” *Journal of Educational Research*, 1931, Vol. 24, pp. 57-61.

²⁴ Berry, Mildred Brown, “Correlations between Intelligence, Reading Ability, and Achievement in Biology,” unpublished master’s thesis, Peabody College, Nashville, Tenn., 1929.

Otis Self-Administering Test of Mental Ability and the *Ruch-Cossman Biology Test* and *Coopridger's Information Exercises in Biology*.

An examination of the table shows that the intelligence test scores give rather low correlations with the biology test scores secured at the beginning of the year. Fairly high correlations are secured between scores secured at the end of the year, however. These data may be interpreted as indicating that the amount of biological information which pupils entering the class possess does not depend altogether on intelligence. Their ability to acquire biological information does depend to a large degree on intelligence, but previous interests and environmental factors are also important. Results on either of the biology tests when given at the first of the year correlate higher with results secured at the end of the year than do results on the *Otis Test*, as is shown by the data in Table LIV.²⁵

On the whole, it can be said in the case of biology, as of the other high-school subjects, that intelligence tests are not so useful for purposes of classification and prediction as they are in the elementary grades. There are several reasons why this is so. The most important is that by the time the high-school age is reached, many poor students have been eliminated. The range of intelligence in high-school students is not so great as in the lower school ages. Again, the high-school pupil is allowed a greater freedom in selecting his courses. Naturally, he selects those in which he has greater interests. Interests and motivation may tend somewhat to make up for poor innate ability, provided the latter is not too poor. If the pupil has only average learning ability but an intense interest in a subject, he may do as well as if he had superior

²⁵ *Ibid.*, pp. 34-36.

learning ability and little interest in the subject. These and other factors make it exceedingly difficult to predict success in a school subject on the basis of intelligence test scores.

The fact that prediction of achievement in biology is difficult does not mean, however, that tests of various kinds should not be used. A pupil who does poor work in his class should be systematically investigated. Probably an intelligence test should be given such a pupil or an inquiry made as to how he gets along in his other courses. Reading and vocabulary tests may show that the pupil is unable to get the content of biology because of poor language ability. Pupils who have inferior mental ability will very likely have trouble in developing a scientific vocabulary and in understanding scientific principles and theories.

Learning and teaching biology. Biology, like the other sciences, presents a number of difficulties to the student and to the teacher. The vocabulary burden of the subject is great, as may be seen by reference to Table XXIX page 238. Not only is the vocabulary difficult because of the number of new words which must be acquired, with their meanings, but the subject is usually their first more or less systematic approach to the scientific field. Many students reach high school with very little training in the use of language for recording observations in an accurate manner. Up to this time, language training is usually of the kind which has a literary emphasis.

There is a great difference in the use of language for purposes of arousing in others images and ideas possessing an effective tone and the use of language to record accurately a definite observation. The one allows, or rather demands, great freedom of expression and interpretation;

the other calls for the delimitation of expression and interpretation.

The teacher of biology, also, must decide for each student or group of students the division of time between laboratory and demonstration work. No one at present knows just what this division should be at any level of ability and achievement. For beginners, in experiments with four equivalent groups, Cooprider²⁶ found that teacher demonstration gave somewhat better results than laboratory work or pupil demonstration. He also found that results depend to a large degree on the closeness with which the work is supervised.

The problem of the value of ready-made drawings as compared to student drawings in biology was studied by Taylor.²⁷ In this study, parallel groups of students taking introductory botany at the University of Oregon were subjects. In the one group the students drew copies of the specimens that they were studying in their laboratory work, while the students in the other group were given ready-made drawings of the specimens. Each group labeled the various specimens. Tests given at the completion of the exercises showed that the latter group had a better grasp of the facts, this finding being true for students of low ability as well as for those of high ability.

Measuring the results of biology instruction. The problem of measurement in biology, as in the other high-school sciences, is difficult because there is no general agreement as to minimum essentials. There are, however,

²⁶ Cooprider, J. L., "Laboratory Methods in High School Science," *School Science and Mathematics*, 1923, Vol. 23, pp. 526-530; and "Teacher versus Student Demonstrations in High School Biology," *School Science and Mathematics*, 1926, Vol. 26, pp. 147-153.

²⁷ Taylor, L., "The Ready-made Drawing with Relation to Student Achievement," *School and Society*, 1930, Vol. 32, pp. 371-374.

several well-standardized and reliable tests which the high-school teacher may have at his disposal.²⁸

There are several specific uses of biology test scores which may be summarized as follows:

1. Tests may be used for the purpose of making an inventory of what pupils know when they enter the class. The size of the scores will indicate the information which the pupils possess. An analysis of the scores should furnish some information concerning pupil interests.

2. One of the most important uses of tests relates to the diagnosis of teaching and learning conditions. An analysis of scores should indicate to the teacher where pupils have failed to profit from instructions.

3. It is now generally recognized that homogeneous grouping is desirable. In a large high school it is best to group pupils in such a way that the curriculum may be enriched for the superior students and the difficulties of the weaker may be given special attention.

Thought Problems

1. Contrast the subject matter of physics and chemistry. In what ways are the pre-course experiences of pupils in physics and chemistry different? Which of the two subjects is the more concrete? Which is more directly related to the pupils' experiences?

2. Suppose that none of the particular facts of chemistry are remembered after the chemistry student leaves school. Do you think that there are certain points of view and attitudes which may remain and because of which a study of chemistry might be justified? Name some of the more general things secured from chemistry which may function in later life.

²⁸ See Blaisdell, J. G., *Instructional Tests in Biology*, Yonkers-on-Hudson, N. Y., World Book Company; Coopriders, J. L., *Coopriders Information Exercises in Biology*, Bloomington, Ill., Public School Publishing Company; and Laidlaw and Woody, *Michigan Botany Test*, Bloomington, Ill., Public School Publishing Company.

3. If intelligence and chemistry scores are available, study the relation between the two. Can you draw any conclusions from Wolf's data in Table LII?

4. Secure samples of standardized tests and examine these for the purpose of selecting tests which will measure the achievement of pupils in classes you have taught or visited. Compare them with respect to the ease of administration, time requirements, cost, reliability, ease of scoring, and probable usefulness of the results which may be secured.

5. Of what do the biological sciences treat? The physical sciences? Is there an overlapping field between the biological and physical sciences? Name some topics which might be placed in either field. Give the chief difference between the biological and physical sciences.

6. Since so much physics information is already possessed by the pupil when he enters the physics class, what are the chief problems in learning physics in high school? Is the world one of law and order, cause and effect, or chance and fate, according to the concepts of the average adolescent?

7. If it is found that pupils with intelligence quotients of less than 108 do not do satisfactory work in physics, how might that fact be interpreted? Does it mean that such pupils should not study physics? Or does it mean that the organization, content, and method of teaching should be changed? If test scores are available, study the relation between mental ability and achievement in physics.

8. Do you agree that a good measure of what people of the world think about is to be found in the kinds of material they read? If so, what does the material in Table XLVI show?

9. List what you consider the two most important aims of biology teaching.

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CHAPTER XVI

Psychology of the Social Studies

The social studies deal largely with man and his many relationships. The physical sciences, in contrast, are concerned with the natural world and deal only slightly with human affairs.

The social studies, as they are generally listed, include history, geography, civics, sociology, economics, and sometimes psychology. The present chapter deals chiefly with history because the other subjects are rarely offered in high school. Of the other subjects, civics and geography are sometimes offered. It is to be regretted that geography has not made greater progress as a high-school subject; however, there is a strong tendency to unify the various subjects by drawing on all in the study of a given topic in any one subject. Thus facts in sociology and economics are presented in the history course. In so far as the material is well organized for teaching purposes, this is desirable because there are few topics which belong to one of the social studies alone.

What is history? In undertaking a study of the psychology of teaching and learning in the social studies, it seems that some definitions of the social studies, and of history in particular, should be given. The various social studies have often been defined. Inglis gives the following statement regarding the social studies:

The social studies are understood to be those whose subject matter relates directly to the organization and development of human society, and to man as a member of social groups.¹

Some statements as to history are given below:

History, in its broadest sense, is everything that ever happened.—JOHNSON.

History comprises the whole period of the development of human society from the earliest stages for which evidence has been preserved.—MONROE.

History is primarily a socio-psychological science.—LAMPRECHT.

History is a study which deals with man's social activities, economic, political, educational, artistic, and religious.—FLING.

History is the science of the development of men in their activity as social beings.—BOURNE.

From these definitions we can, perhaps, draw the general conclusion that history is at least a record of social progress, with man as the instrument by which it has come. This idea, however, cannot be carried too far, or the fields of sociology and economics will be invaded. The word *history* seems to be a generic term which serves as a handle to fit many subjects. In fact, history as a separate entity in the list of courses is something imaginary; it does not exist concretely apart from the something of which it is a history.

Objectives of history teaching. It is essential for good teaching and learning that the teacher know just what the purpose of instruction in history and the other social studies is. If we desire to secure in a brief statement a summary of the function of the social studies, Marshall

¹ Inglis, Alexander, *Principles of Secondary Education*, Boston, Houghton Mifflin Company, 1918, p. 544.

and Judd furnish us with the excellent statement which follows:

Their purpose is that of giving our youth a realization of what it means to live together in an organized evolving society; an appreciation of how people have lived and do live together; and an understanding of conditions precedent to living together well, to the end that our youth may develop ideals, abilities and tendencies essential to effective participation in a dynamic society.²

The aims of instruction for any subject will determine the materials to be taught, their organization and grade placement, and the manner in which they are to be presented. In arriving at a satisfactory list of aims to be realized through the teaching of history, the same difficulty is encountered as may be found in the search for a single definition which would be universally acceptable. There are many aims which the study of history attempts to satisfy, and there are some duplications; but as yet there is no agreement as to any specific set of aims, nor is this expected when it is remembered that history is a wide field and has many applications.

The statement of the objectives of any subject is of little value in itself. The teacher must constantly keep in mind just what she is attempting to do with any specific unit of subject matter. The important thing is to have an aim which looks toward the development of the pupil and then organize and present materials through pupil activities which will accomplish the desired result.

Factors influencing the learning and retention of history. Effective history teaching must take into account the factors which influence learning and retention.

² Marshall, Leon C., and Judd, C. H., in *The Twenty-Second Yearbook of the National Society for the Study of Education*, Part II, p. 76. Quoted by permission of the Society.

History in the main is not so concrete as are many of the other school subjects. It deals largely with relationships and events rather than with concrete objects. A study of history involves the development of notions of time and distance. The events treated have many ramifications—so many, in fact, that the pupil never feels that he has explored them all.

Much of the material presented in history and geography carries the child beyond the point which he has actually experienced. In history, for example, the child through his readings may be carried back to the days of the Greeks and he may study their customs and manner of living.— [In such a case] the materials are concerned with experiences which are remote in terms of time. In geography, on the other hand, the child learns about places and peoples widely separated in terms of space. We use the term imagination when we are trying to picture to ourselves events and conditions beyond our physical environment. Memory and learning, as well as other so-called mental processes, are factors in all our experiences dealing with events which are remote in either time or space.

Language habits are important for the social studies. They make possible not only delayed responses but many ideas that are of such a nature that the individual seldom thinks of them in connection with a definite object or place. "Good citizenship," for example, is a term used to denote a whole system of ideas and habits possessed by the persons of a country. These words are the embodiment of certain ideas and they convey specific meanings. The value of the part language plays in [the] imagination and other mental processes cannot be too much emphasized in the social studies. Much of the material in the social studies is composed of ideas concerning economic life and social relationships. These ideas are expressed in language which summarizes a variety of different situations and conditions and which appears to make them more definite.³

Probably the type of imagery used by the pupil in

³ Garrison, S. C. and K. C., *The Psychology of Elementary School Subjects*, Richmond, Johnson Publishing Company, 1929, pp. 532-533.

studying history is of less importance than his ability to deal with the more abstract aspects of the subject, which involves little concrete imagery of any type. The student of history is required to reconstruct in his imagination conditions and circumstances which he has been able to experience only in a vicarious way through his readings and class discussions. Pictures, maps, charts, and historical objects are valuable in that they furnish more concrete materials on which imagery may be based.

Since history deals almost entirely with concepts and relationships temporally in the past, it is necessary for the pupil to remember a large number of events in their chronological order. This fact distinguishes the study of history from that of the many other subjects. In most school subjects, memory is one of the psychological processes which is absolutely essential in learning. In teaching history, the teacher must remember that the pupil has not only the added burden of remembering events but that of remembering their temporal sequence as well. If historical relationships and movements are to be understood, they frequently must be given a time perspective. The teacher must strive to develop a sense of time in the pupils. Proper organization and effective presentation through the tracing of temporal and causal relationships aid the pupil very materially in his learning.

Sex differences in history. Several studies have been made regarding the differences in the achievement of boys and girls in history.⁴ In general, it has been found that boys are slightly superior to girls on the average and that the boys retain this superiority on subsequent retests.

⁴Eikenberry, D. H., "Permanence of High School Learning," *Journal of Educational Psychology*, 1923, Vol. 14, pp. 462-481; and Bassett, Sarah Janet, "Sex Differences in History Retention," *School and Society*, 1929, Vol. 29, pp. 397-398.

Boys are superior in the retention of facts relating to wars, discoveries, and the like. The girls are superior, however, in retaining history which deals with home life and domestic affairs.

It is not likely that sex differences in ability in the school subjects are due in any large degree to original differences. Acquired interests probably play a very important part in history achievement. Such differences as do exist are significant, however, whether they are a result of innate or of acquired conditions.

Relation of learning exercises in history to local affairs and events. Probably the difficulties in the high-school work in history relate more largely to the fact that history knowledge is often abstract and unrelated in either time or space to the personal experiences of the pupils. Facts which are concrete and personal tend to be remembered. Instruction in history needs to emphasize the important facts through the use of pictures, posters, dramatization, and personal experiences wherever possible.

It is possible for the teacher to provide personal experiences by introducing a large amount of concrete and local material. In almost any community there will be found persons or things which are connected with past events. Local names, the names of families, and the like, frequently may be associated with movements. There is a wealth of material in almost any community which may be used for purposes of illustrating and of securing interest.

Teachers frequently regard history as something relating to the past and which has no connection with the present. They fail to appreciate the wealth of material at hand. One of the writers recently came across a situation where the pupils studied American history for a

whole year in high school in addition to devoting time to it in the grades. They spent much time on the settlements along the Atlantic, yet not one knew anything about the settlement of the community in which the high school was located—one of the original thirteen States. An interesting fact observed was that the teacher of history had taken work in American history in college for a whole year and in addition a semester's work in the history of States including the one in which the school was located. Despite the fact that the teacher had been reared in the community in which he was teaching and had graduated from the local high school, he was totally ignorant of the history of the settlement of the community and was greatly surprised to learn that the settlement was a very fascinating story in itself. He afterwards told the writer that he had discovered that he was the seventh generation to cultivate corn in a lowland in which there was an old chimney, all that remained of the home of the original settler, his direct ancestor. Furthermore, the land which he had inherited had never been out of the hands of his direct ancestors since it was bought for three peppercorns from the Tuscaroras. Almost every pupil in the school bore the name of an original settler. It is unnecessary to state that the teaching of American history was revolutionized in this school as soon as the pupils had their attention called to this fact.

The psychology of time and history teaching. History is unlike most other subjects in that a sense of time is absolutely necessary for its successful study. The concept of time is developed in the child somewhat in the same way that all his concepts are developed. However, the time concept has the added qualities of duration: past, present, and future. The young child's ability to understand

time is limited because of his lack of maturity and experiences. As the child matures, he comes to think of many things as past. Those of which he thinks in connection with his experiences usually involve the notion of past, present, or future, while those which he regards in an impersonal way rarely do so. To think of a thing with reference to time involves the notion of past, present, or future—probably all three of these. A large number of things are thought of as involving time, not because they intrinsically involve a notion of time but because they are associated with past experiences or anticipated future experiences.⁵

It is readily seen that a notion of time is essential for history, since history is largely based on the notion "past." We have a feeling of pastness with regard to all our experiences. In fact, the present, when we attempt consciously to apprehend it, must be interpreted as intimately related to the past and future. The analysis of the "sensible present" by James is especially significant in this connection:

In short, the practically cognized present is no knife-edge, but a saddleback with a certain breadth of its own on which we sit perched, and from which we look in two directions into time. The unit of composition of our perception of time is a *duration*, with a bow and a stern, as it were—a rearward- and a forward-looking end. It is only as parts of this duration-block that the relation of *succession* of one end to the other is perceived. We do not first feel one end and then feel the other after it, and from the perception of the succession infer an interval of time between, but we seem to feel the interval of time as a whole, with its two ends embedded in it. The experience is from the outset a synthetic datum, not a simple one; and to sensible perception its

⁵ James, William, *Principles of Psychology*, New York, Henry Holt and Company, Inc., 1890, Vol. I, pp. 605-610.

elements are inseparable, although attention looking back may easily decompose the experience, and distinguish its beginning from its end.⁶

It is only when we study the psychology of time that we realize the importance of dates in history. If a student's perspective is to be more than just a jumbled array of memories with few causal relations, it is essential that he remember accurately the dates of certain important events. As James remarks, "Date in time corresponds to position in space." The student is able to construct mentally periods of great duration by imagining remoter times in terms of fixed historical events. There is a point, in learning dates, beyond which it is in general uneconomical for the pupil to go. The important thing is the development of a time sense and not the memorization of dates. Furthermore, dates associated with important events in history can well be used in developing a better understanding of the temporal and proper chronological element in our development. Clucas⁷ presents 26 dates in American history that appeared in three of five important courses studied. These dates are: 1492, 1607, 1619, 1620, 1775, 1776, 1783, 1787, 1789, 1803, 1812, 1820, 1823, 1848, 1850, 1860, 1861, 1862, 1863, 1865, 1890, 1898, 1900, 1914, 1917, 1918.

The insistence by high-school authorities on chronology in history teaching is hardly in keeping with the facts revealed by a psychological analysis of the development of a sense of time. If "pastness" is developed from memories of immediately preceding past events, it would seem much

⁶ *Ibid.*, p. 610.

⁷ Clucas, C. S., "The Problem of Dates in the Teaching of History and in Measurement," *Journal of Educational Psychology*, 1932, Vol. 26, pp. 90-96.

more psychological to begin with modern life and work back into the more remote periods than to do just the opposite. In history teaching, as in the teaching of other subjects, the facts of the subject are more concrete and more easily grasped than the facts of child development; consequently, the teacher's mental content and points of view are likely to be determined by a certain amount of material to be mastered rather than by certain attitudes and concepts to be developed by the pupils. The sense of time develops from experiences which are constantly changing and which have short duration. The units of duration which may be taken in at one time are limited to only a few seconds. We may easily conceive a distance of a hundred yards by measuring or estimating that distance and then observing the points which fix its limits. It is impossible to conceive of spaces of time in this manner. Here we vocally or mechanically count a certain number of seconds or minutes. We may not observe the whole during any one act. The smaller units in which time is conceived, thus, may not be observed in an instant, as may the smaller units of space. Consequently it is more difficult for pupils to develop a notion of time.

The development of concepts in the social sciences. Concepts develop out of experiences. It is by means of concepts that we interpret present experiences in the light of past experiences. They represent the generalized meanings which we may have secured from our experiences. They are the bases for our interpretation of the world of affairs. Each individual reacts to situations as he meets them according to the meanings which he has previously developed. It is important, then, that children secure desirable concepts in the social sciences, since so many of the problems of today relate to these sciences.

For the development of social concepts, it is important that concrete situations be provided. The following quotation stresses this fact:

In practically all communities there are opportunities to study events and projects which will lead to larger and larger projects and which are of great interest and value to the pupils. A knowledge of how people formerly responded to their environment and of social, political, and economic conditions can well be secured by studying the early settlement of almost any community. What kinds of homes did the early settlers build? Why did they build at certain places? Under what conditions did they live? A study like this is valuable in that it provides a concrete approach to problems and conditions of today. In dealing with the social studies it is unnecessary to use imaginative topics and theoretical situations. Children are much more able to grasp fundamental issues met by the average citizen when these issues may be compared to concrete conditions. Theoretical problems should not be used unless there is some special reason for doing so, and generally there is not. Neither is it necessary to go very far from home to find situations which raise all the fundamental problems of a democracy.⁸

Social concepts have not only an interpretive value, but a developmental value as well. The teacher must remember that the concepts are not fixed, but that the truly educated person continues to create new ones and to modify and enrich as well as abandon old ones. Psychological concepts change with experience; they furnish the materials for thought and the tools of thought; they are developed by and aid in securing new experiences. In short, concepts are to be thought of not as developed but as developing.

Investigations have shown that there is a steady growth in children's concepts from grade to grade. In a study⁹

⁸ Garrison, S. C. and K. C., *op. cit.*, pp. 531-532.

⁹ Meltzer, Hyman, "Children's Social Concepts," *Contributions to Education*, Teachers College, Columbia University, 1925, No. 192.

in which a list of social concepts was submitted to children in the various grades for the purpose of interpretation, it was found that there was a significant growth in this respect. The data for grades five to eleven are given in Table LV. It will be noticed that the gain is greater between certain grades than between others. This fact is probably explainable in terms of the social materials taught in the several grades.

In the same study, it was found that children's grasp of the concepts correlated positively with five important factors. The correlations with the five factors were as

TABLE LV

GROWTH OF SOCIAL SCIENCE CONCEPTS FROM THE FIFTH THROUGH THE ELEVENTH GRADE. (*After Meltzer.*)

Grade	V	VI	VII	VIII	IX	X	XI
Mean.....	27.40	45.59	67.60	78.60	86.00	95.00	158.91
P. E.....	+3.05	+2.33	+2.34	+4.32	+2.20	+3.00	+4.30

follows: with educational age, $.80 \pm .04$; with grade, $.69 \pm .03$; with mental age, $.58 \pm .04$; with chronological age, $.55 \pm .04$; and with occupational status, $.36 \pm .03$. It is significant that a high correlation was found between educational age and ability to grasp social concepts, although this is what one naturally expects.

Developmental values in history. Probably no subject is richer in value for the student than history. It deals directly with the problems which man as a social being has faced in the past. Inglis says of history:

History must always be conceived as one of the principal subjects of study operating toward the attainment of the social-civic aim of secondary education. In common with the other social sciences it deals directly with social phenomena as its content. . . . It differs from the other social studies (except as they may assume an historical aspect) in that: (1) it deals with the phenomena of human activity in

their actual processes, dynamic and genetic; (2) its field is more extensive and permits the contact with widely variant conditions; (3) it makes possible the understanding of existing conditions which cannot be appreciated except in terms of the past; (4) it allows opportunity to interpret cause and effect in human action where that relation cannot be seen except with the passage of time; (5) its study offers one of the few opportunities afforded in the secondary school to gain an understanding of other countries and other peoples.¹⁰

A study of history has at least two direct developmental values for the student. In the first place, it furnishes opportunities for forming judgments regarding men and social phenomena of the past. The most important part of the environment of man is his social environment. The individual is affected directly, however, only by that part of his environment with which he comes in contact. This part, of course, is limited, because it is impossible for him to experience directly things which have already happened or even a large number of those which are happening in the present. Indirectly he may be the "heir of all the ages" through the study of literature, art, and history. History is valuable as a subject in the high-school curriculum because it provides the pupil an opportunity to enlarge his field of experiences indirectly. It furnishes the individual a basis from which he may get a perspective of man's gradual intellectual and moral development.

History performs, in the second place, an important social function in that it traces the development of social evolution and thereby aids in creating a social solidarity. Dealing with the development of social institutions, it shows how our laws, customs, traditions, and the rest of our common social heritage have come to be what they are.

¹⁰ Inglis, Alexander, *op. cit.*, p. 547.

A study of history should thus give an appreciation of our social institutions. It should show how changes have been effected in the past and should lead the pupil to see that our social institutions are not static and perfected, but still in the formative stage. It should lead to higher ideals of citizenship and a desire to aid in making the world a still better place for all people. By focusing attention on man's achievement, it should make the pupil conscious of his obligations to society.

Presenting historical material. When the vast array of aims and values which are to be realized through the various kinds and grades of history are considered, the methods of presenting the material are seen to be relatively few in number and not essentially different in type from those used in the presentation of other secondary-school subjects.

From the literature in the field, the following appear to be the most widely used methods of teaching history:

1. Factual.
2. Dramatization.
3. Question-and-answer.
4. Project.
5. Assigned reading and reports.
6. Teaching by use of maps, charts, outlines, and notebooks.
7. Teaching with emphasis on time epochs.
8. Teaching with emphasis on movements.
9. Biographical.

No one of these methods will fit equally well all the history courses offered in the high school. The same teacher will doubtless find it to his advantage to employ different methods in teaching different courses. The type of school, the customs of the community, the length of

time to be devoted to the course, the amount of material available for use in giving the course, the size of the class, the text in use, and, especially, the resourcefulness of the teacher are factors to be considered before the best methods of instruction can be determined. The use and placement of questions in social science materials was studied by Washburne.¹¹ He used 1,456 pupils in grades seven, eight, and nine in his study. A story of about 3,000 words, "How the Florentine People Struggled for Democracy," was prepared in five forms differing only in the placement of questions. He found from a study of five comparable groups, among other items, the following: (1) The best place for questions is at the beginning. This was found to be true for comprehension and recall of facts covered by the questions, and it was also found that such an arrangement produced no injurious effect upon other materials. (2) Interspersing questions at the beginning or end of paragraphs containing the materials to which the questions are related improves comprehension of the facts thus covered without injury to the comprehension of other materials. (3) Placement of questions at the end of the story produces a gain in the comprehension and recall of facts covered by the questions but interferes with the comprehension and recall of other facts.

Aside from the techniques which are developed and made use of in the special methods, many other aids or devices are employed with special reference to developing certain objectives of the teaching of history. The number of devices made use of will depend upon the skill of the teacher and the body of helps which he has at hand. If a teacher wishes to get over to his class any one of the

¹¹ Washburne, John N., "The Use of Questions in Social Science Material," *Journal of Educational Psychology*, 1929, Vol. 20, pp. 321-359.

above objectives with the fullest force possible, he must use certain types of emphasis. These are so closely bound up with the skill and nature of the teacher and with the particular phases of the work which he wishes to emphasize that no fixed device designed to satisfy any one objective can be prescribed. The general rule that the technique of teaching history, as an instrument for clarifying historical material, should not be difficult in itself to understand or apply should be followed.

Vocabulary. The vocabulary of ancient history contains a large number of uncommon words. Shambaugh¹² found that in one ancient history textbook used in the ninth grade of many schools, there were 1,734 uncommon words. In contrast to this, another text had 898 such words and still another book only 396. By way of comparison, a study by Powers¹³ showed that the average number of uncommon words appearing in general science texts was 1,324; the average in chemistry texts, 1,660; and the average in biology texts, 2,040.

The problem as to what materials in ancient history are essential naturally arises. What materials are necessary if the pupils are to attain the objectives of history teaching? Undoubtedly many of the terms found in ancient history refer to persons, places, and events which are mentioned merely incidentally in connection with the development of some topic. On the other hand, there are terms which are important in the development of certain concepts and relationships. The teacher attempting to guide the learning process of the student must

¹² Shambaugh, C. G., "A Study of the Vocabularies of Ancient History Texts," *School and Society*, 1928, Vol. 28, pp. 494-496.

¹³ Powers, S. R., "The Vocabularies of High School Science Text-Books," *Teachers College Record*, 1925, Vol. 26, pp. 369-382.

be able to differentiate between the essential and the non-essential.

In another study,¹⁴ it was found that authors of history textbooks vary considerably in the number of words they use to elucidate the more common concepts of history. One author used 115 common words to each technical word while another used 261 common words. It is thus seen that, in teaching concepts or meanings, authors differ widely in the number of words they find it necessary to use. Too little attention has been given in texts in the social sciences to the teaching of meanings. It is important that teachers become definitely conscious of the need for emphasis on meanings in order to aid children to develop clear and rich historical concepts.

Reviews. Aside from the drills which are included in the examination, it is worthwhile that other drills, with a different purpose in view, be conducted at such intervals as seem necessary to fix the big facts and their contexts in the minds of the pupils.

The psychologists writing most recently are beginning to discount the so-called "law of frequency" as one of the important phases of the learning process. But, with the abundance of partially organized and co-ordinated material to be found in the study of history, we are not sure but that a review of associated facts at frequent intervals connects them closely with the original process of learning. For a pupil to learn an isolated fact is one thing; for him to learn it in its natural setting with knowledge of antecedent and consequent is something different. The review or drill is the process of fitting together into a

¹⁴Barr, A. S., and Gilford, C. W., "The Vocabulary of American History," *Journal of Educational Research*, 1929, Vol. 20, pp. 103-121.

unified whole the broken parts which have already been learned. This is but another method of gaining one of the objectives of history study—organization.

How frequent or extensive drills need be may be judged by the content of the course. A great many teachers practice the plan of reviewing, or having some student review, the material covered the previous day and then going on with the new material; others give a rather extensive review at the end of the period; others bring into the review those facts which bear directly on the movement studied. The form that the review takes should vary with the complexity and organization of the materials.

As for the weekly or monthly drill on dates and isolated facts, sometimes taking the form of a bee, there is not much that may be gained by it, while a great deal of something different and more important is being lost through it. Only those drills which materialize into something of ultimate worth or appreciation need to be emphasized.

Provisions for individual differences. Not all students find history interesting. Not all students are able to comprehend with equal facility the subject matter of history. There is a rather high correlation, it is believed, between interest and ability. A lack of interest in most cases is due to the manner in which history was approached in the elementary school. The blame cannot always be laid upon the elementary teacher, however, for a method of history teaching which will appeal to one student in a way to enlist his full interest will be repelling to another. The implication here is that a variety of ways which will provide some type of interest to which all pupils will respond should be employed. The teacher,

the text, and the resources which may be commanded will determine the extent to which classwork can be motivated.

Whether we recognize it or not, specialization frequently begins in the high school; in fact, a large part of our people have received in the past whatever special training they possess in the high school. There is an inclination on the part of pupils who plan to go no farther than high school to discount all subjects save the ones which they think will provide the vocational training desired. History, in most cases, is one of the subjects which are looked upon as being of little worth in helping one to secure a job and earn money. The teacher must show these students that good citizenship, worthy participation in society—and ultimately in one's vocation—and one's chances of what is commonly termed "success in life" can all be greatly strengthened through courses in high-school history if the right motives for study are enlisted. It follows as a natural corollary that when no appeal is made to the right motives of one of these students, or when these factors are not worked into his high-school training, the country and society lose the highest possibilities to be expected from one of its members. It is extremely doubtful whether the training and the point of view should be the same for these pupils as for those preparing for college entrance, yet almost every class contains pupils of both types. These differences between the aims for different individuals must largely be met by the teacher with whatever devices and helps he can command to so organize and motivate the material that every pupil will be getting that which will best serve his needs in so far as the teacher can determine them. For the teacher to recognize distinctly that not all of his pupils can be expected to profit

alike from the offering of history courses in the high school, that his class is not homogeneous, that many of his pupils are deriving a large part of whatever social-civil values they will ever get from any organized course of study in their present high-school classes, and that he has a responsibility in the matter, is a long step toward motivating the work to suit the needs of his pupils, for it is believed that no conscientious teacher can recognize the importance of the responsibility and continue to do little or nothing about it.

Measurements. A number of tests have been constructed for history, civics, and geography. Few tests have been devised for an integrated social science curriculum. The *Kepner Background in the Social Sciences*¹⁵ is a good example of testing in the integrated social science field. The tests are of value primarily as diagnostic or inventory measures of the information which pupils bring to school. The tests consist of seven exercises and appear to be well standardized. One of the writers found a coefficient of reliability of .83 between Forms A and B for a group of 71 tenth-grade pupils.

Examples illustrating some of the types of exercises are reproduced here. These show methods of testing which social science teachers might profitably follow.

Exercise I

In each of the sentences below you are given four choices for the last word. Only one is the correct word. In each sentence draw a line under the correct word.

1. The Pilgrims came in a ship called the *Pinta*
Half-Moon *Mayflower* *Plymouth Rock*.
2. A period of one hundred years is called a generation
fortnight decade century.

¹⁵ *The Harvard Tests, Background in the Social Sciences*, published by the Harvard University Press, Cambridge, Mass.

14. Soviet Russia was organized under the leadership of Sun Yat-sen Tolstoy Romanov Lenin.

Exercise III

In the sentences below one and sometimes two words are omitted. In each case write the proper word or words in the blank spaces so as to complete the sentences accurately.

1. Traveling from New York to London, you would cross the _____ Ocean.
13. Distance on the earth's surface measured north and south is called _____.

Exercise IV

Examine carefully the words and phrases that follow and indicate the correct phrase with a mark X.

1. The League of Nations is an attempt to
 - _____ crush Japan.
 - _____ abolish all monarchies.
 - _____ form a family of nations.
12. Imperialism is the desire of a country to
 - _____ unite the people of one race and speech in one nation.
 - _____ be a member of a family of nations.
 - _____ expand or add to its land possessions.

Exercise VI

In the following exercises, indicate the time order in which each took place (held office, lived, etc.), by placing the figure "1" before the event which took place first, the figure "2" before the event which took place second, and so on through the five events. The first one is done.

- | | |
|---------------|---|
| 1. Presidents | 4. Amendments to the Constitution
(order in which added) |
| 5 Taft | _____ Direct Election of Senators |
| 1 Monroe | _____ Woman Suffrage |
| 2 Jackson | _____ Abolition of Slavery |
| 4 McKinley | _____ National Prohibition |
| 3 Cleveland | _____ Voting Rights to Negroes |

*The Pressey-Richards Test of Understanding of American History*¹⁶ is one of a number of tests which have been devised for measuring pupil achievement in American history. It consists of tests on four different elements of history. These are:

- Test 1: Character Judgment.
- Test 2: Historical Vocabulary.
- Test 3: Sequence of Events.
- Test 4: Cause-and-Effect Relationships.

Many other tests dealing with various aspects of social science have been devised within recent years. Many of these give promise of measuring, in addition to the factual materials, attitudes, understanding, and reflective judgment relating to social science materials. The importance of attitudes in relation to education and the necessity for measuring them are coming to be recognized more fully today than ever before. Thus, tests of civic attitudes, values, and interests have been developed.

The reliability of social science tests is usually low for several reasons. The range of information covered at the secondary level is much greater than it is at the elementary level, and students on the secondary level consequently have a much wider range of materials in which they may develop specific interests. Again, there is considerable lack of agreement as to the objectives of instruction in history, and, as a result, the minimum essentials are not agreed upon. Despite the lack of reliability, standardized tests are valuable for motivation and diagnosis when used in connection with definite assignments and new-type tests.

¹⁶ Pressey, L. C., and Richards, R. C., "Understanding of American History," Bloomington, Ill., Public School Publishing Company.

Thought Problems

1. State in a brief paragraph with just what the social studies deal. Is there a clear demarcation between the province of one of the social studies and that of another? How would you differentiate history from geography? From civics? From economics?
2. State in definite terms your definition of history. Of geography. Of civics. Of economics.
3. In what way do you think that reading ability is related to achievement in history? If pupils are available, administer a reading test to them and then study the agreement between their reading scores and history achievement.
4. Write a paragraph on how the child develops a sense of time. How is a time sense related to ability in history? Is a sense of space related to ability in history in the same way?
5. Observe for several periods how a good social science teacher presents the materials of instruction. Note how difficult points are clarified, how interests are developed, and what provisions are made for individual differences.
6. How is the learning of history similar to and how different from the learning of physics, chemistry, and biology?

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CHAPTER XVII

Psychology of the Practical Arts

Historical note. The practical arts are older than the liberal arts. Since the dawn of civilization man has been engaged in occupational activities involving more or less skill. In primitive times, the boy followed his father in hunting and fishing and in time, through the processes of imitation and suggestion, coupled with the learning which results from trial-and-error activity, became fairly efficient in these occupations. The girl, at home with her mother, acquired the simple arts of preparing food, dressing skins, and tilling the soil. These were the woman's contributions to the necessary work involved in making a living. As these arts became more complex, they were transmitted from father to son, and as these processes necessitated better organization, there grew up the system of apprenticeship, which organized the efforts of the young learner. This form of training has existed to some degree and in some manner throughout the development of civilization. Even today we find it existing to a large degree, although oftentimes quite disguised, as in the case of the young lawyer going into partnership with the older successful lawyer, and so on.

The European countries began specialized training for boys and girls destined for the vocations of the industrial world about the middle of the last century in an effort to readjust their apprenticeship systems to meet the demands

of the modern manufacturer. Germany's progress in securing world-wide trade before the World War was attributed to its extensive and thorough system of vocational education for its students. The economic necessity of making the most of their resources forced these countries to train skilled workers. Switzerland and France have profited greatly from vocational education along lines of agriculture and industrial arts. Such education was especially necessary during the skilled trade period of civilization. In this period, which still exists but is in part being largely replaced by a machine form of civilization, the various trades were carried on through skilled handiwork types of activities. In it we have such performances as molding, weaving, and so on.

At the present time, certain students¹ are pointing out the significance of the use of machinery to replace the skilled trades, in which case the machines are operated and fed by an unskilled worker who, aside from being able merely to do a single task, does the work that formerly required a large number of skilled workers. What this is going to mean for the training of skilled workers is hard to predict; but it seems destined to revamp our education even further, in harmony with establishing habits, interests, and attitudes that will enable man to use his leisure time—which seems destined to become greater—to better purpose. The problem of the most desirable balance between education for a vocation and education for just living harmoniously within this world of ours is one that will continue to be a fundamental problem for the philosophy of education.

Vocational development in secondary education. The

¹ Furnas, C. C., "The Ultimate Industrialism," *The Scientific Monthly*, 1930, Vol. 31, pp. 43-50.

question of how much specialized vocational training should be given in the high school is one concerning which there is a great lack of uniformity of opinion among educators. It is a question that has come into greater prominence with the enlarged function of the high schools in response to the increased demands of industry and society. In attempting to arrive at an answer to this question, we should consider individual needs and growth in the light of the fact that recent developments in relation to social and industrial activities have practically excluded children (especially those under sixteen years of age) from industry, and that scientific discoveries and developments in our agricultural and industrial activities no longer make it essential to employ the labors of children to produce the needs and luxuries of our present-day life. These conditions, along with other changed conditions already referred to, make it probable that most boys and girls will be unable to find places in our industrial life before they have attained the age of approximately eighteen or twenty years.

The situation with respect to vocational training has been modified especially by the rapid development of machinery that tends to do a major portion of the skilled work formerly done by hand and by the complexity of our social order, which demands a type of training planned for living as well as for making a living. In so far as vocational needs are concerned, the high schools should not be expected to give the boys and girls a high degree of specialized training in some specific field of work. The high schools should not be looked upon as finishing schools in which boys and girls attain such proficiency that they are able to enter into some activity with a maximum of

efficiency upon graduation. In answer to the question: What should a graduate be able to do? Edmonson says:

1. He should be able to mingle with people with a reasonable degree of confidence.

2. He should be able to work happily and co-operatively with other people.

3. He should be able to meet the usual requirements for a competent person in the way of health and physical fitness.

4. He should be able to follow instructions promptly and faithfully to the end that he may profit readily by instruction on the job.

5. He should be able to adapt himself readily to new kinds of employment as a result of the high school training secured in the vocational courses of an exploratory character.

6. He should have a fair command of the major skills emphasized in one or more of the vocational departments of the school, *i. e.*, general shop, household arts, commercial, unless he has definite plans for entrance to college following graduation.²

These proposals indicate that the more specific forms of training should be done on the job after, or perhaps sometimes during, the period of the school training. The changes in the practices of various industries are directly in harmony with such proposals, for industry is more and more training on the job those boys and girls who show aptitude and ability and have the desired attitude and personality qualities. In this case, vocational emphasis becomes more general in nature, the high-school boys and girls acquiring general habits, knowledge, and skills applicable to a number of specific types of work. Desirable attitudes toward work, and habits of co-operativeness, tolerance, honesty, and social understanding become essential elements among the desired vocational needs of our high-school boys and girls.

² Edmonson, J. B., "Vocational Needs of Youth," *School of Education Bulletin*, the University of Michigan, 1934, Vol. V, p. 117.

A. Home Economics

Home economics is one of the most recent studies to be added to our secondary-school curriculum despite its long existence in the form of apprenticeship training. Along with the advancements in the social and natural sciences, there has been a correlated need for further habits of skill in the field of the household arts. Since its inclusion in the curriculum, it has been changing constantly in the attempt to find its true function in relation to the school program. In the study at present one can detect the change from the abstract to the concrete, from the formal materials to the materials applied in a meaningful relation. Home economics in the high-school curriculum was early taught in a rather logical manner with little attention given to the logical correlation of the different elements. Most of the work consisted of disconnected lessons in cooking and sewing. An example of this former instruction (and it is frequently found even today) is the teaching of a lesson on the preparation of some food with no attention to the place of this food in the meal or series of meals. The psychological approach would have been to plan the meal in its proper series and then prepare the dish in the laboratory. The approach to a food lesson should be from the idea of meals rather than of individual dishes.

Formation of habits. There is always the question of what habits are to be formed and in what way they are to be formed. In the case of home economics, there has been an attempt to develop in the beginning high-school girl the same habits that are being developed in the college student. That this is so probably has been due to the lack of training of teachers in materials and methods of

secondary-school work in home economics. Just as is the case with the learning of any other school subject, the home economics abilities and habits to be acquired must be built upon those already acquired. Many simple habits have been established in connection with home economics work by every boy and girl in the secondary school. Further habits must be based upon their previous experiences which have been instrumental in developing the habits present in the beginning home economics student in high school. The habits should be built up in a related manner, the lessons in cooking growing out of the cooking activities found in the homes; from these lessons can be developed further the concept of the proper diet, the planning of the balanced meal, and the serving of special dishes. As further habits are developed, it will be noticed that the activities become more and more complex. As a habit develops, there is a development of the neural and muscular tissue. Again, there is a co-ordination and an integration of behavior units that make a general reaction pattern. In the high-school pupil, complex habits and skills necessary for planning and manipulation, as are certainly required in home economics work, can be developed if the proper order is followed in the formation of habits. Home economics work gives the opportunity for the development and co-ordination of habits of manipulation, judgment, planning, imagination, estimation, and problem solving and other habit systems into a larger whole.

Interests and applications. There is probably always an original interest either directly or indirectly related to the content and method of work found in home economics. If the work is related to this innate interest or even to the early acquired interests, the progress and habits of the student will be materially affected. Even though a girl has

grown up to play with her brother and to take part in his various outdoor activities, when she reaches the high-school age and becomes one of the high-school social group, she will begin to be interested in her personal appearance and will spend more time in connection with it. At the same time she will also become interested in the appearance of others and in their manners.

A study was undertaken by Mary Beeman³ with the purpose of finding out whether high-school girls are interested in the activities performed at home, whether there are other activities in which they are interested but have no chance to perform in the home, and whether routine home activities that appear dull might be made more interesting. The data were collected from three sources: first, general types of interest revealed in the writings of psychologists, child leaders, advisers, and others studying girls or working directly with them; second, reports by girl pupils of their likes or preferences with the reasons; and third, observations made by home economics teachers of their pupils' interests as expressed in classroom and social activities.

In regard to the girls' interests as observed by the teachers, there was a strong preference for neat and orderly appearance, general self-improvement, improvement in manners and observance of etiquette, and practice of personal hygiene. The least interest was found in following friends and in changes occurring in the home.

According to their teachers' observations of their interests in other girls, high-school girls seemed more interested in the "crowd" and a little less interested in their mothers. The friendship of an older person outside the family seemed slightly less important than the companion-

³ Beeman, Mary, "A Brief Study of the Interests of the High School Girl in Home Activities," *Journal of Home Economics*, December, 1929.

ship with their fathers. This study confirms the opinion that the adolescent girl longs for recognition, desires to take responsibility and to organize her world differently as well as efficiently, is anxious to improve social conditions, and looks forward to a definite career.

After an interest in home economics, which is probably latent in most cases, is aroused, it is quite easy to develop the habits of appreciation, which are in reality an important part of the home economics work. These habits of appreciation are found to carry over into the social life and into the home, providing the home economics course is not formal in nature and detached from the child's life experiences. By carrying the benefits of the work over into the home, the habits developed in the home economics course are being overlearned and thus are becoming fixed as a part of the individual. The greatest task for the home economics teacher, as for the teacher of other subjects, is to present the material so that they can be carried over into other subjects and even into out-of-school activities—to teach it so that it fulfills the requirements of generalized experiences—to teach it so that the appreciation makes a definite and lasting impression that will function even in connection with remote situations.

Correlation of the different elements. The elements of home economics are very closely correlated, as has already been shown to be the case with respect to the facts and principles of chemistry. In the process of growth of home economics ability, it is found that a correlation of these different elements into a meaningful whole will best fit the individual's learning ability. The skills involved in home economics must be acquired by doing, but there is a certain amount of information that is essential for the development and performance of the acts of skill. Judgment and appreciation are outgrowths of the information

and acts of skill acquired. The planning, making, and appreciation involved in a dinner that is to be served to some guest is a case in point; and the planning, making, and appreciation of a dress is a case in point in connection with another phase of the home economics work.

Individual differences in home economics. Home economics is a subject that can be presented in a simple form to younger pupils and, as mental maturity is reached, the subject matter of which can be increased in complexity. Both the subject matter and its presentation should be influenced by the development of the mental capacity of the pupils.

Individual differences can be taken into account in home economics by planning work in the laboratory in relation to the speed and methods of presenting the subject. Miss Engle,⁴ in a study of the intelligence of girls electing home economics in high school, found that there was no reliable difference between their average I. Q. and the average I. Q. of girls not electing home economics. These findings are not wholly in line with those of Book.⁵ Book found, from a study of the intelligence of high-school seniors in Indiana, that the average intelligence of students electing vocational courses was inferior to the average for the high-school students at large. Both studies show a wide variation of ability in the home economics classes. Laboratory work, if not too formal in nature, will well provide for student initiative and the correlation of the materials with other life activities. The basic principle of providing for individual differences by socializing

⁴ Engle, Edna M., "How Intelligent Is the Girl Who Elects Home Economics?" *Journal of Home Economics*, Vol. 21, p. 171-178.

⁵ Book, W. F., *The Intelligence of High School Seniors*, New York, The Macmillan Company, 1922.

the work and correlating it with other school and out-of-school activities can well be applied to home economics work.

Correlation of home economics with other subjects. There has been a definite attempt on the part of home economics teachers to co-ordinate the home economics work with some of the other work in the school curriculum. This effort has found expression in the science work, in the various school programs, in out-of-school activities, in the music work, and in the various extracurricular activities of the school. The necessity for using facts and principles of science to explain the materials used in the home economics work has been the main reason for the use of science materials in connection with the home economics work. In general, co-operation between science and home economics has been of three types: (1) requirements of science courses as prerequisites to the home economics courses; (2) co-ordinating the work of home economics and the sciences, especially chemistry; and (3) the correlation of science and home economics materials.

Formerly very little relation was effected between the home economics work and the social science work; but the World War tended to bring about a greater correlation, and today social science of a functional nature is definitely related to and in many cases a part of the home economics work. The great social structure and its various phases of growth and development can very definitely be connected with different types of skills developed in the home economics courses.

During the school year 1929-30, Katherine Wright⁶

⁶ Wright, Katherine, "The Place of Home Economics in the Educational Process," unpublished master's thesis, North Carolina State College, University of North Carolina, 1930.

made a study of the relation of abilities in home economics to the academic subjects in an attempt to find out how the abilities of students "carried over," if they did so. Information tests devised by the home economics division of Teachers College, Columbia University, were given to a group of senior home economics students of the Raleigh High School, these students having completed at least two years of home economics. The same group was also given the *Terman Group Test of Mental Ability* and the *North Carolina High School Senior Examination, 1930 edition*. Table LVI shows the relationship between the scores on the various mental and achievement tests.

TABLE LVI

CORRELATIONS BETWEEN TEST SCORES IN HOME ECONOMICS AND VARIOUS MENTAL AND SCHOLASTIC TEST RESULTS

1. Home economics test score and <i>Terman Group Test</i> . . . . .	.29 \pm .09
2. Home economics test score and senior-high-school home economics score. . . . .	.37 \pm .08
3. Home economics test score and partial total on senior-high-school test* . . . . .	.31 \pm .09
4. Home economics test score and reading and study habits on senior-high-school test. . . . .	.38 \pm .08
5. Home economics test score and general science on senior-high-school test. . . . .	.37 \pm .08

* "Partial total" refers to the total of scores in reading, English, mathematics, and general science as given on the senior-high-school test.

According to the results of this table, one would conclude that a slight but positive and reliable relationship exists between home economics ability and intelligence, as well as between home economics ability and other school abilities. The lowest correlation was found with the *Terman Group Intelligence Test*. This test is to a large degree a measure of abstract intelligence, whereas home economics is an aptitude or ability requiring information, muscular co-ordination, attitudes, and a social type of in-

telligence and interest. These various elements are to a degree independent of abstract thinking, which is a capacity ordinarily measured by the group intelligence tests. The home economics test results gave highest correlations with school habits, while the science test scores yielded a correlation of $.37 \pm .08$. It is especially interesting to note the fact that reading and study habits are more closely related to home economics ability than is intelligence. This fact leads one to realize that home economics is an attitude or special habit system of thinking and reacting which is built up through guidance in reading and studying.

B. Manual Arts

Manual arts and the junior-high-school age. Historically, manual arts have been taught during the junior-high-school period (ages 12 to 15), where boys are passing through a period of physical growth. At this age there are an added physical development, enlarged social contacts, and a general mental expansion. These changes bring with them a realization of approaching maturity with its varied responsibilities. It has been pointed out in earlier chapters that there are an awakened social consciousness and a new self-realization at this period of life. Many boys reaching the junior-high-school age are unable to find an outlet for their interests and abilities in the more formal type of teaching so often presented in the academic subjects. They do not see the relations between such subject matter and the problems of life. Manual training definitely correlated with academic subject matter, on the one hand, and the boys' experiences, on the other hand, will tend to bring together the factors of interests, abilities, and experiences. Furthermore, such training at this age

gives the boy an opportunity for doing things that he can do and that he recognizes as significant in his daily life.

The junior high school, along with the senior high school, is constantly receiving an increased number of boys and girls who were formerly eliminated for various reasons. An effective organization of the work at this stage of pupils' lives will provide opportunities for growth on the part of the pupils who are not interested in the more academic type of materials and who are unable to carry on the abstract type of thinking needed in a formal organization of academic subject matter.

Manual arts needs. The need for a certain amount of motor skill is well-nigh universal. With the constant increase of mechanical appliances, there has not resulted

TABLE LVII

MANUAL ARTS ACTIVITIES RANKED IN ORDER OF FREQUENCY OF NEEDS MENTIONED. (*After Fuller.*)

1. Paint house.	16. Mend locks.
2. Sharpen knife.	18. Reputty glass.
4. Sharpen scissors.	20. Build fence.
4. Put up clothes line.	20. Hang shades.
5. Paint floor.	20. Plane tight door.
7. Paint screen.	23. Stop rat holes.
7. Tighten screws in furniture.	23. Build chicken-coop.
9. Paint outbuilding.	24. Put new spring on screen door.
9. Sharpen skates.	26. Rehang screen door.
11. Varnish furniture.	26. Make hens' nest.
11. Paper room.	27. Polish furniture.
12. Make fly swatter.	28. Fit and lay linoleum.
13. Paint interior woodwork.	29. Make swing.
14. Sharpen ax.	31. Wax floor.
16. Put knob on drawer.	31. Stop leak in faucet.
16. Put new screen wire on frames.	32. Put shelf in closet.

an elimination of the need for mechanical skill. The increase of such appliances has brought about a very definite redirection of such activities. A few years ago Fuller

made a study of manual arts needs based upon home repair.⁷ The results of this study are presented in Table LVII. These data were gathered by means of a questionnaire presented to students in the Columbia High School and the University High School and to college students in the university shops of Columbia, Missouri. A more recent study would show that many of these activities are still prominent, but there would now be included a great number of activities related to electrical appliances.

Transfer of training. If industrial arts are to have the vocational transfer value that is often claimed for them, the materials selected for them and the procedures of teaching them must be in harmony with the psychological principles of learning. Art materials that are meaningful and related to life experiences will yield the greatest transfer when the methods of teaching are such that not merely the performance of some specific sensorimotor task, but also the principles involved as they function in the various sensorimotor performances, are stressed.

Even in the narrower fields of manual dexterity and visual discrimination, Langdon and Yates⁸ found no evidence of transfer from training in specific tasks. One can safely conclude that a course in industrial arts will insure neither better appreciation of art activities in life nor more skilled performances in the various tasks requiring sensorimotor ability. It is quite plausible, however, that a stress on principles relative to form, structure, texture, pattern, and the like, will effect a greater amount of transfer. If these principles are shown to relate to better appreciation

⁷ Fuller, L. R., "Manual Arts Based on Home Repair," *Journal of Educational Research*, 1921, Vol. III, pp. 173-179.

⁸ Langdon, J. N., and Yates, Edna M., "An Experimental Investigation into Transfer of Training in Skilled Performances," *British Journal of Psychology*, 1928, Vol. 19, pp. 422-437.

and better performance, and the student is led to see the significance of such principles as they apply to industrial arts tasks and situations, there will be an increased range and a greater amount of transfer. This increased transfer will apply not only to art situations but also to other related situations.

The studies by Seashore and others have not supported the hypothesis of a general motor ability.⁹ Seashore used the Stanford motor skills battery of tests, consisting of a number of different tests for motor skill, in studying the general motor skill ability. In this study, 50 male subjects were given the Stanford battery of tests. The results from these tests were correlated with an objective success score for operating winding machines. The correlation thus obtained was $.14 \pm .10$, which is too low to be of any significance.

Mechanical ability and intelligence. It has been urged by some investigators that it by no means follows that a person who is efficient in dealing with words, numbers, and other symbols will be efficient in mechanical operations. Various studies of the relationship between results from mechanical aptitude tests and scores on mental tests have been made.¹⁰ Positive correlations thus obtained have shown a rather wide range; however, these correlations are, in the main, rather low. These low correlations may

⁹ Seashore, S., "The Aptitude Hypothesis in Motor Skills," *Journal of Experimental Psychology*, 1932, Vol. 14, pp. 555-561.

¹⁰ Stenquist, J. L., "Measurements of Mechanical Ability," *Contributions to Education*, Teachers College, Columbia University, 1923, No. 130; Carter, H. D., "The Organization of Mechanical Intelligence," *Journal of Genetic Psychology*, 1928, Vol. 35, pp. 270-284; McElwee, E. W., "A Study of Mechanical Ability and Homogeneous Grouping," *Journal of Juvenile Research*, 1932, Vol. 16, pp. 304-309, and "Standardization of the Stenquist Mechanical Assembling Test, Series III," *Journal of Educational Psychology*, 1932, Vol. 23, pp. 451-454.

result from (1) the greater interests of gifted children in reading and thought activities, and, consequently, less interest in mechanical activities; (2) the fact that the training and general activities of superior children are quite often of a verbal rather than a mechanical type; and (3) elements other than intelligence, such as manipulative skill, motor precision, and the like, which are essential in mechanical ability. These factors may or may not be associated with superior intelligence. There are some elements present in mechanical ability that are not dependent upon abstract intelligence. Some specific sensory and motor capacities may not be closely related to mechanical ability, since mechanical ability represents a pattern of traits. A more careful analysis of the elements involved in this pattern reveals an interrelation of a multiplicity of traits. Perceptual ability, sensory capacity, motor control, motor discrimination, accuracy of estimate, observation ability, and other elements, some of which are definitely related to mental ability, are present in mechanical ability. Proponents of the dissociation of mechanical ability and abstract intelligence base their conclusions wholly upon correlations between the variables.¹¹

Mechanical ability and environment. Anderson¹² reports the results of some studies as to the relationship of certain environmental conditions to mechanical ability conducted at the University of Minnesota. In order to determine this relationship, correlations were obtained between seven phases of 100 boys' environments and two

¹¹ See: Page, M. L., "The Mechanical Ability of Subnormal Boys," *Journal of Applied Psychology*, 1933, Vol. 17, pp. 164-181.

¹² Anderson, L. D., "The Relationship of Certain Environmental Factors to Measures of Mechanical Ability," *The Twenty-Seventh Yearbook of the National Society for the Study of Education*, Bloomington, Ill., Public School Publishing Company, 1928, Part II, pp. 137-151.

mechanical shop criteria. The mechanical shop criteria scores were based upon (1) success in manipulation of mechanical tools and materials, and (2) amount of information possessed about tools and materials.

The results from these correlations indicate that there is not a significant relation between the environmental factors and success on the mechanical prognosis tests. The data do present evidence that mechanical success is more dependent on the mechanical operations of the son than on those of the father. The boys' early experiences with mechanical toys and various manual art activities develop an interest that becomes a motivating force in relation to manual arts activities.

Measuring mechanical aptitude. For measuring the special abilities requisite for success in different mechanical pursuits, various tests have been developed. The *Stenquist Mechanical Aptitude Tests*¹³ were probably the earliest tests of this nature to be developed. These tests have been widely used and results from them give a positive and significant correlation with intelligence test scores. The *Detroit Mechanical Aptitude Test*¹⁴ has been developed for both boys and girls. This is a paper-and-pencil test and has been found to have a high coefficient of reliability and yields positive and significant correlations with shop success. The *MacQuarrie Test for Mechanical Ability*¹⁵ and the *Minnesota Paper Form Board Test*¹⁶ are paper-and-pencil tests. These tests are

¹³ Stenquist, J. L., "Measurement of Mechanical Abilities," *Contributions to Education*, Teachers College, Columbia University, 1933, No. 130.

¹⁴ Barder, H. J., and Crockett, A. C., *Detroit Mechanical Aptitudes Examination*, Bloomington, Ill., Public School Publishing Company.

¹⁵ MacQuarrie, T. W., "A Mechanical Ability Test," *Journal of Personnel Research*, 1927, Vol. V, pp. 329-337.

¹⁶ Paterson, D. G., Elliot, R. M., Anderson, L. D., Toops, H. A., and Heidbreder, E., *Minnesota Mechanical Ability Tests*, Minneapolis, University of Minnesota Press, 1930.

reported to have a coefficient of reliability of .90. Inter-correlations between the MacQuarrie and Minnesota aptitude tests were found by Symonds, after a study of three high-school groups, to be .484, .425, and .421.¹⁷

Mechanical aptitude probably comprises a combination of a number of abilities. Tests designed to measure it oftentimes measure more or less different abilities. Tests of aptitude are of special value in predicting success in a specific field, but their use and interpretation should always be considered in terms of intelligence. A person achieving a high score on the mechanical aptitude test might be expected to succeed in a simple or concrete mechanical performance, but he should not be expected to do a great deal of work of a creative and imaginative type. He should be largely free, in his shop activities, from abstract performance.

C. Telegraphy and Typing

The curve of progress. Telegraphy is a rather complex type of sensorimotor learning in which the auditory and motor factors are very important; and, since Bryan and Harter¹⁸ as early as 1897 performed experiments in this form of learning, their studies are of especial interest. Their studies are of interest not only as pioneer ones, for the experimenters' careful analysis of the nature of the learning process increases the value of their studies. Unlike many other investigators who claim that the plateau in the curve of progress is due primarily to the nature of the learning process itself rather than to some psycho-

¹⁷Symonds, P. M., *Tests and Interest Questionnaires in the Guidance of High School Boys*, Bureau of Publications, Teachers College, Columbia University, 1930.

¹⁸Bryan, N. L., and Harter, N., "Studies in the Physiology and Psychology of the Telegraphic Language," *Psychological Review*, 1897, Vol. IV, pp. 27-53.

logical factors related to motivation and effort, they found from an analysis of the individual learning curves that fairly continuous progress was made in the learning of the code letters of the telegraphic alphabet, but that there was little if any gain in speed until these letters were learned in groups of syllables or words (patterns)—which is a slower process.

This idea of a *hierarchy of habits*, as they called it, is especially applicable to the more complicated learning tasks. Their explanation appears quite plausible, and undoubtedly plateaus may and often do arise from the nature of the learning tasks, along with the nature of the units of learning which are used in plotting the learning curve. However, that is not a satisfactory explanation for all learning plateaus. They say of the irregularity of the curve of progress, "The curves of Figure — show also, however, that for many months the chief gain is in the letter and word habits, that the rate of receiving sentences is, in this period, mainly determined by the rate of receiving letters and words, and that rapid gain in the higher language habits does not begin until letter and word habits are well fixed."¹⁹

Some problems in learning. The purpose of the investigation by Bessie A. Young²⁰ was to study the value of the double period in typewriting. To secure data on the subject, she arranged to have tests given in 75 schools where the single period was used and 20 schools where the double period was used. The total number of test papers obtained for tabulation was 3,300. The tests consisted of the following: (1) a test in straight copy work for examining speed and accuracy, (2) a test to determine

¹⁹ Bryan, W. L., and Harter, N., "Studies in the Telegraphic Language," *Psychological Review*, 1897, Vol. IV, p. 356.

²⁰ Young, Bessie A., "Relative Efficiency of Single and Double Periods in Typewriting," *Balance Sheet*, 1932, Vol. 14, pp. 7-10.

accuracy, (3) a test in letter writing, (4) an identification test on the parts of the typewriter, (5) an identification test of the use and function of the characters on the machine, (6) a test in syllabication, (7) a true-false test, (8) a multiple-response test, (9) the *Lessenberry Letter-Writing Test*, and (10) a test in copying, computing, and tabulating an invoice.

Among other items listed, the following results were found:

The single period is yielding slightly more than the double periods.

The tabulation of results reveals the fact that in many cases in which this test was involved, those who had double period instruction were marking time. At the lower range their scores were superior, but in the higher range the single period group surpassed them in speed and accuracy, letter forms, syllabication, true-false, multiple-response, *Lessenberry* test, and on the invoice.

The results reveal that intensive methods of teaching in single period classes would result in better typing students, with a great saving of time.

If students can become just as proficient in a single period of forty-five minutes, it should not be necessary to compel them to waste time in longer periods which might be used very advantageously in other fields of work closely connected with typewriting, for example, English, shorthand, and spelling.

Just as in the case of music, there arises the problem of practice with a single hand or practice with both hands at the same time. In the simpler acts of skill, it is more economical to learn the whole act as a unit. The typing act is rather complex; but simultaneous practice of the two hands is essential if rhythm is to be developed. There is, furthermore, the principle of learning by doing, according to which the pupil should practice an act the way in which he is to perform it. It may become essential to carry on a great amount of practice and drill on some combinations

of finger movements of the right or left hand. Drill may be very effective when carried on with a two- or three-finger combination, but the typing act should, aside from this, be an act learned as it is actually performed—with the simultaneous use of both hands.

Measurements in stenographic work. There have been a number of attempts to devise more objective methods of selecting stenographers within recent years. The work of the Civil Service Commission, as well as the development of such tests as the *Ruggles Diagnostic Clerical Test*, are illustrative of the type of tests that are being constructed for measuring clerical aptitude. The Ruggles test consists of tests of: comparison, numerical estimation, alphabetical filing, classification, copying, and computation.²¹

TABLE LVIII

CORRELATION OF VARIOUS ABILITIES WITH THE RESULTS OF A TYPE WRITING TEST. (*After Tuttle.*)

	<i>Correlation</i>
1. Motor action and typewriting test.....	.54
2. Sense of rhythm and typewriting test.....	.10
3. Attention and accuracy test and typewriting test:	
Part I.....	.41
Part II.....	.68
4. Memory span and typewriting test:	
Part I.....	— .30
Part II.....	— .11
5. Ability to follow directions and typewriting test.....	.17
6. Substitution test and typewriting test.....	.52

Measurements in these various phases of office or clerical work will be of immense value in determining the nature of the ability involved and in diagnosing special difficulties. In an early study, Tuttle²² attempted to

²¹ Ruggles, A. W., "A Diagnostic Test of Aptitudes for Clerical Office Work," *Contributions to Education*, Teachers College, Columbia University, 1924, No. 148.

²² Tuttle, W. W., "The Determination of Ability for Learning Typewriting," *Journal of Educational Psychology*, 1923, Vol. 14, pp. 177-181.

analyze the abilities involved in typing. The results from his study are presented in Table LVIII. These correlations indicate that such abilities as attention and accuracy, motor action, and substitution are especially important in relation to typing ability. Tests comprising these various abilities are valuable as instruments for diagnosing difficulties in typing.

D. Physical Education

Physical education and leisure. New forces are so shaping American life that the population has centered in the cities, society has been industrialized, child labor has been abolished, the workman has been freed from the toil of long and arduous hours, and groups are constantly brought together in closer communion and fellowship. These changed conditions make new demands upon the various educational agencies. This almost undreamed-of amount of leisure has brought with it its problems. Increased leisure time will not guarantee a richer and fuller life. People may have a great deal of leisure time without habits or knowledge that will enable them to use it in making satisfactory adjustments, and unrest and discontent may result from it.

In their service to leisure time, physical education, recreation, and hobbies are of prime importance. Education for the use of leisure time, through developing recreational habits that will function beyond the school campus, may become the most potent factor in saving many from falling into a mental abyss or meeting some dire social or biological fate. Physical education should be looked upon as a form of education which prepares one for life and for more complete living. Aside from its great value of serving in stimulating mental and physical vigor and furnishing rest for the wearied soul, it

will bring with it as by-products health, skills, good postures, strength, and endurance.²³

Measuring motor ability. Attempts to analyze a motor act usually meet with a great deal of difficulty. However, in the field of industrial psychology some rather noteworthy advancements have been made. Acts of skill are unitary responses and require the combination of many abilities. There is a need for both simultaneous and successive motor acts. Such elements as strength, accuracy and precision, rhythm, reaction time, and sensory co-ordination are especially important in the skilled act. Observation will reveal that individuals differ widely in their ability to learn various acts involving motor skill. With respect to such ability, individuals may be judged by the following: (1) ease and proficiency in learning new co-ordinations, (2) proficiency in a wide variety of motor activity, and (3) ease, grace, and form in performing activities.

The study of Ragsdale and Breckenfield was designed to determine the interrelationships among certain physical and motor traits of junior-high-school boys. One hundred and fifty-five boys ranging in age from eleven years and four months to seventeen years and four months were studied for the following traits: (1) skills involved in football, basketball, track, and field athletics; (2) height and weight; (3) chronological age; and (4) intelligence. From this study, they concluded:

(a) The older boys have greater ability than the younger boys in activities of the strength type and lesser ability in speed of running. (b) The taller and heavier boys have greater ability than the smaller ones in activities of the strength type and lesser ability in speed of running. (c) Speed

²³ Williams, J. F., "The Contribution of Physical Education to the Education of the College Student," *Teachers College Record*, 1927-28, Vol. 29, pp. 109-121.

of running has a negative relationship to performance in activities of the strength type. (d) These three relationships just mentioned may be partially explained because of the growth changes, especially the lengthening of arms and legs, that are characteristic of boys near to puberty. (e) Boys of this age do not have proficiency in a wide range of motor activities. Because of irregular development and specialized ability of boys in this school group, training programs need to be carefully adjusted to individuals, both to take advantage of special abilities and to promote well-rounded development. (f) Each activity demanding accuracy of sensori-muscular coordination must be learned for itself. There is no general factor of accuracy.²⁴

Chapter III gives intercorrelations between various physical measurements. According to the data presented, physical measures somewhat related show rather high correlations, although all correlations are materially reduced when the factor of age is controlled. Various measures of physical skill have been developed and point scales have come into use in the evaluation of the performances.²⁵ Such a scale gives certain points for the various items, and the score is obtained by adding the total number of points secured.

Individual differences and play activities. Play activities often throw light upon a child's social adjustments. For example, one will sometimes find a child overactive in his play. This is often a symptom of maladjustment.

²⁴ Ragsdale, C. E., and Breckenfield, I. J., "The Organization of Physical and Motor Traits in Junior High School Boys" (reprinted by permission from the October, 1934, issue of the *Research Quarterly of the American Physical Education Association*).

²⁵ For a description of certain measures used, see: La Plate, W. R., "A Study of Relative Values of Thirty Important Activities in the Physical Education Program for Boys," *Research Quarterly of the American Physical Education Association*, March, 1931; Rogers, R. R., *Tests and Measurements Program in the Redirection of Physical Education*, New York, Teachers College, Columbia University, 1927; Bliss, J. F., "A Study of Progression Based on Age, Sex, and Individual Differences in Strength and Skill," *American Physical Education Review*, 1927, Vol. 32, p. 13.

Sometimes a child attempts to show off in the group because he feels that he is not accepted—because he has a feeling of inferiority; it sometimes happens that he is thus overstimulated by certain organic conditions; it may be an overstimulation from some physical stimuli; or it may be an overcompensation for restraint in the home or school. Play, therefore, becomes an important device for adjusting to trying situations of life. With the added use of leisure time, there is a great need today for the education of children in methods of play. It is here that education will aid the child in overcoming difficulties in life.

Play and social development. Lehman and Witty²⁶ made a study of the play interests of 6,886 children who were grouped according to their rates of progress in school. No appreciable difference in the number of games in which different groups participated was noticed. The retarded child tended to play more in the social type of game.

Physical education activities are more dependent upon motor performances than are the activities involved in the other elements of the school program that have been studied. It has already been pointed out that there is no close relation between the various measures of motor ability and intelligence; however, in the more complex types of play, superior mental ability will count for a great deal. Enormous differences exist in the various motor tests that are used in examining different phases of the individual's make-up that contribute to his physical education ability. These wide differences make it essential for the school to provide a well-balanced physical education program that will harmonize with the abilities of the

²⁶ Lehman, H. C., and Witty, P. A., "Play Activity and School Progress," *Journal of Educational Psychology*, 1927, Vol. 18, pp. 259 and 318.

pupils concerned and at the same time fulfill the aims set forth for physical education.

Thought Problems

1. What are some special abilities important for success in the practical arts? How are these related to aptitudes?
2. Where does theory function and where practice in practical arts work? Illustrate.
3. Why is it so difficult to measure practical arts aptitude? Practical arts success?
4. Analyze some act of skill and rate the habits involved. Do you notice a hierarchy of habits? Do you see the presence of theory as well as practice in the development of the habit?
5. How are the practical arts activities related to each other? To the other phases of the school's program?

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CHAPTER XVIII

Psychology of the Fine Arts

A. Music

Music as an international language. Music is probably the only language that men of every nationality understand. It is a form of language used by both primitive and civilized peoples. The earliest music was made up of rhythm connected with sounds carrying special meanings, for instance, the mother's lullaby, the warrior's battle cry, and the tribal songs of worship. There are good examples of this stage in the development of psalms and in the *Iliad* and the *Æneid*. Even in later times, the songs of the troubadours and Meistersingers were primarily chants in which rhythm was the main feature.

One of the earliest musical instruments that we know anything about is the drum, first a hollow log with a skin drawn over it. The earliest music had no means of representation, no scales, no staff, no melody, and no harmony. It was merely a monotonous chant in the minor mode.

Primitive people were fond of this simple music, using it in their everyday life, their dances, and other activities. Men were the first musicians, and not until the classical period did women come to function in the production of music by means of instruments. The early Egyptians constructed crude harps, flutes, banjos, and lyres. The

Hindus used a stringed instrument played with a bow, a crude likeness of our violin. Wind instruments, cymbals, and the harp were used by the Hebrews. The early development of the organ, the choral song, and, with the Renaissance, the beginning of opera were important landmarks in the greater use of music as an international language. Each nation's progress can, to a certain extent, be traced by the music of that nation. During a period of contentment, one finds light, cheerful music; during a war, patriotic tunes are heard; and during a depression or disastrous state, one finds sad, minor compositions.

Practically all people appreciate music of some nature. Some like classical music, some like popular music, and some like old ballads. The ability to understand and appreciate music varies considerably from person to person. Some have an innate capacity that enables them to appreciate good music quite readily, while others may acquire this appreciation. Some factors related to such abilities will be discussed later in this chapter.

Music as a "natural gift." Ability in music has been regarded as almost entirely a result of innate structure. This view has received a great deal of support from two sources. In the first place, musical talent often appears very early in the child's life; for example, Mozart, Mendelssohn, Beethoven, Paganini, Kreisler, and others were early musical prodigies. A second source of support for this contention comes from the absence of a significant relation between musical ability and intellectual ability. When a group of children with intelligence quotients above 135 were tested for six elements regarded as fundamental in musical ability (sense of pitch, intensity, time, consonance, rhythm, and tonal memory), their scores

were found to distribute themselves in a manner similar to those of a group of unselected children.¹

Among those children who are of very poor musical ability may be found children of practically all degrees of intelligence. And, vice versa, among practically all levels of intelligence have been found children who possess a superior amount of musical ability.²

Socially, psychologically, and pedagogically, the career of Paderewski is of especial interest. His mother was an accomplished musician, therefore there was a musical influence present in his social environment from the earliest period of life. Paderewski was cognizant of her influence on him, for he says, "If we look but casually into the pages of musical biography, we find the great and invaluable role which such mothers have played in the lives of master musicians."³ Furthermore, Paderewski constantly emphasizes the fact that music mastery is a result of self-control, of work and constant effort applied under careful guidance. He recognizes the importance of work, of interest, and of zeal as accompaniments of certain elements in one's make-up that are referred to as "musical talent." The careers of such men as Mozart, Mendelssohn, Beethoven, Liszt, and others give examples of individuals who not only were talented from childhood, but who were encouraged and in many cases driven by their musical parents in an attempt to give them the right cultivation during the early, plastic years of life. Nature

¹ Hollingworth, Leta A., "The Musical Sensitivity of Children Who Test Above 135 I. Q. (Stanford Binet)," *Journal of Educational Psychology*, 1926, Vol. 17, pp. 95-109.

² Minoque, B. M., "A Case of Secondary Mental Deficiency with Musical Talent," *Journal of Applied Psychology*, 1923, Vol. VII, pp. 349-352.

³ Phillips, C., *Paderewski, The Story of a Modern Immortal*, New York, The Macmillan Company, 1934, pp. 177-178.

has thus placed no limitation on the facts of interest, self-discipline, and sacrifice on the part of the child. It is said that Paderewski during his adolescent years often practiced long hours. In his case there is an inherent talent, but his musical mastery developed because of the interest, zeal, and effort applied in connection with this talent.

The social function of music. Because its basis is in the biological nature of man, and because its suggestive nature aids it in determining the trend of social behavior, music serves a rather distinct social function. The most tender feelings of the primitive mother are portrayed in the cradle songs she sings to her babe. The sailor's chants tend to develop a unity of feeling and purpose. The hymns of the church deepen the religious emotions and thus stir the group to a unity in feeling and action. The patriotic songs, the fraternity songs, and the worker's songs are illustrative of musical agencies effective in maintaining a higher morale among the members involved. Social movements, religious movements, and political and economic movements have their accompanying expression in the songs which express the nature, purpose, and direction of such movements.

Objectives of music. The objectives of music study are as follows: First, music is a language, that of emotions; it is the most universal language of the emotional life. The mastery of its technique opens up a vast literature in this realm of human experiences. Second, music is essentially social in its nature; it has been called the most social of all the arts. We may enjoy it as listeners, or we may get even more pleasure out of participating in it, in chorus or orchestra or by hand.* Third, probably no other subject in the curriculum furnishes so much pleasure and

recreation. Lastly, no other subject in the curriculum is more adaptable to valuable training in the social and moral life of the child.

It is impossible and probably not desirable for all children to learn to perform on some musical instrument, but it is desirable that all children know the great masterpieces of music of all countries. It is not an easy thing to select a few numbers and say that these are the best, and so musicians have experimented and found the pieces that are most common and those that are enjoyed most by children. Some of the pieces in the list set up are: Beethoven's *Moonlight Sonata*, Brahms's *Wiegenlied*, Cadman's *From the Land of the Sky Blue Water*, Donizetti's *Sextette*, Dvorak's *Humoresque*, and Grieg's *Peer Gynt Suite*. In studying these, the children acquire the best possible taste in music. It is easy to present these pieces to the child by the aid of the phonograph, the player piano, and the radio. Another way of presenting musical material is to provide to have local or traveling artists sing and play before the children at regular intervals. The child must hear a piece of music a great many times before he will really like it and feel that he is a part of it.

Elements in musical talent. The term *musical talent* is not specific in nature but includes a variety of performances, many of which are unlike others. It includes the ability to sing, to play the piano, the violin, or some other such instrument, to compose, and so on.

Scientific studies and common observation show us that there are great individual differences in any of the specific musical performances and that an individual may be superior in one of these and mediocre in another. There appear to be, however, some elementary functions underlying achievement in any of these phases of music. The most

important of these are: (1) the acoustic functions related to auditory perception, (2) the motor functions involved in the production of vocal music and also of instrumental music, and (3) intellectual functions related to the creative, interpretive, and appreciative phases. Sometimes musical ability has been analyzed into musical sensitivity, musical memory, musical reaction, musical imagery, musical feeling, musical intellect, and the like. The factors of zeal and application cannot be omitted from a full explanation of any special ability in music. The fact that these are essential for successful performance in any field eliminates them as special elements involved in musical ability.

Measurements of musical ability. Although the testing movement in music is in its infancy, great strides have been made, many tests developed, and much data gathered dealing with various phases of musical ability. The most extensive work in this field has been done by Carl Seashore and his colleagues in the psychology laboratories of the University of Iowa. His phonograph test designed to measure various sensory abilities involved in musical aptitude has been widely used because it is sufficiently refined for general group testing. *The Seashore Measures of Musical Talent* are made of six discs, each of which measures a sensory phase of musical talent. They are designed to measure: (1) pitch discrimination, (2) intensity discrimination, (3) tonal discrimination, (4) consonance discrimination, (5) rhythmic discrimination, and (6) tonal memory. Since the development of these tests, many other musical tests have been produced, and a large number of them are constructed considerably on the order of these.

Diagnostic tests in harmony have recently been devised

by Miss Doris Moon, of Santa Monica. These are objective in nature and easily administered and graded. Their purpose is to discover whether the pupil has sufficient grasp of the material of elementary theory to enable him to continue the subject with profit, and, farther along

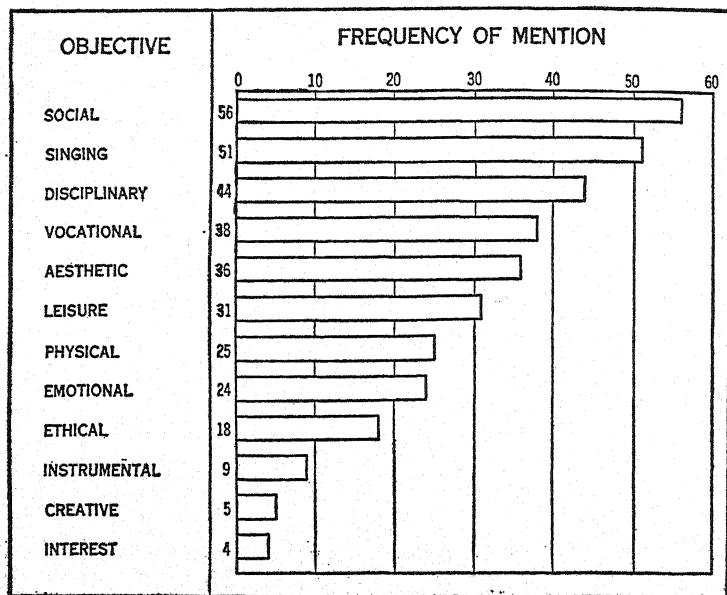


Fig. 13.—Frequency of Mention of General Objectives in Ninety-Six City and State Courses of Study at the Secondary-School Level.⁴

in the course, to find out to what extent he has developed the mechanics of part writing in the handling of fundamental chords in the harmonization of the simple melodies.⁵

⁴ *Instruction in Art and Music, Bulletin*, United States Department of the Interior, Office of Education, 1932, No. 17, p. 7.

⁵ *Ibid.*, p. 35.

The problem of the monotone was studied by Phillips.⁶ This study revealed that monotonism is more prevalent among boys than among girls. Case studies of a group of monotones indicated that some quite likely causes of the condition are timidity, self-consciousness, lack of musical experiences and training, defective auditory sense, and lack of motivation.

Principles of learning applied to music. Music periods in the elementary schools should consist of at least fifteen minutes daily, and in high school the periods should comprise about forty minutes three times a week. In music the whole method is usually better than the part method; especially is this true when a person desires to memorize a piece of music. Of course, if there are several movements, one movement at a time should be learned, since it is a complete piece within itself.

The results from the study made by Brown are of interest in this connection. He attacked the problem of the relative efficiency of learning piano music by the "hands-separate" and "hands-together" methods. Pairs of musical scores were equated and one score was learned by the one method while the other score was obtained by the other. Comparisons were then made of the results obtained from the two methods. The conclusions from these comparisons were: (1) The "hands-together" method is superior in terms of both speed and trials. (2) In the "hands-separate" method, there is a great deal of inefficiency developed as the learner progresses, partly because of the separate memorizing of activities involved in the performance of each hand. (3) There was a greater

⁶ Phillips, Mabel Grossman, "A Case Study of the Monotone Problem in the Junior High School," master's thesis, Indiana State Teachers College, 1929.

amount of pleasure in evidence in the "hands-together" method.⁷

Since music ability is dependent upon a number of variables, there will constantly be a necessity for doing a great deal of individual guidance and direction in its development. Individual instruction is thus necessary, particularly with the semi-monotones. These pupils should be seated in the front of the room so that it will be easy for the teacher to give them special attention.

The importance of familiarity. Familiarity is very important for a real appreciation of music. I may describe a place to you but though I paint a most beautiful word picture, you will never have a real appreciation of the place until you go there yourself. Appreciation develops as a result of experience, and as such cannot be transferred from one person to another. You cannot be taught to appreciate anything, but someone may succeed in arousing your interest. No one can do more than inspire you to want the special experience for yourself. A song leader cannot make people sing, but he can make them want to sing. Real, successful, joyous experience brings true appreciation.

B. Art

The fields of art. The subject of art is generally divided into three main fields—*construction*, *decoration*, and *representation*.

Construction includes the planning and making of single objects, such as buildings, chairs, bowls, and so forth. Decoration includes two things: first, the grouping or arrangement of objects which are placed in relation to each

⁷ Brown, R. W., "The Relation Between Two Methods of Learning Piano Music," *Journal of Experimental Psychology*, 1933, Vol. 16, pp. 435-441.

other, as in a room, in a store window, in a civic center, or on a mantel shelf; and secondly, the enrichment of the surface of objects, as by moldings on a building, carving or inlay on a chair, lettering on a poster, or tooling on leather. Representation includes the portrayal of animate and inanimate things as they appear or may be imagined, for example, by portrait painting, illustration of a fairy tale, photography, sculpture.

In each of these fields, it is possible to study the processes, the products, and the art qualities. For instance, in an art course one may draw a chair, learning how to use pencil or crayon and to apply perspective principles. He may study chairs as they have been developed in different periods, and he may learn to distinguish fine from commonplace chairs.

The processes and technical principles vary in the three different fields, and, of course, the finished products are different; but we find that the same æsthetic principles govern the choice and arrangement in all. Whether we think of a building or of the arrangement of articles in a showcase, we may think of each as composed of shapes and colors and of these as being arranged in some orderly way. The shapes and colors are elements of art expression, and the various guides to arranging them are called *principles of composition*, or *design*.

Art in the high school makes use of these æsthetic elements and principles, which are common to all three fields of art. It uses fine examples from each field and it involves such technical knowledge and such experience in technical processes as are consistent with the aims set forth.

The values of art. The question might arise: What is the value of art? The values of art for all pupils lie in its

daily use in the selection and arrangement of objects, in the pleasure derived from such use, in the broadened interests and sympathy which it creates, and in the increased efficiency which it gives in many lines of work. These are sometimes called *consumer values* in distinction from the *producer values* which the subject has for the talented few who will find in it their vocation.

The general objectives of art education, then, are as follows:

a. *For every pupil (the consumer of art)*. To increase his judgment and taste in regard to what constitutes beauty in his possessions and surroundings and arouse his desire to make these as beautiful as possible, and to develop to the greatest extent his capacity to enjoy beauty as it appears both in his daily environment and in the work of great artists and craftsmen. It should increase his social understanding through acquaintance with the art of other peoples and other times.

b. *For the talented pupil (the producer of art)*. To give varied technical experience which will try out his talent and set forth possibilities for future specialization and to supply knowledge of vocational opportunities and rewards in art and related fields. To aid him in expressing his feelings and thoughts in a fuller and richer manner and thus provide him a source for filling his social, biological, and recreational needs.

Correlation with other subjects. These objectives of art may be reduced to the statement that its purposes are to develop the appreciation of beauty in form, color, and arrangement and the power to express it in various ways. Other subjects in high school contribute to these objectives, and the relationship of art to these subjects may be clarified by an examination of the following analysis:

1. Home economics devotes some time to a study of form and color in clothes and in the home. To the extent that it does this, the subject contributes to art education.

2. Industrial arts devote some time to studying the proportions of objects to be made, their finish, and their surface enrichment. In these ways and others, they contribute to art education.

3. Science demands drawings in connection with laboratory work, and if these are criticized for their fine arrangement and technique, it contributes to art education. The study of physical laws in relation to light and color, the study of chemistry in relation to pigments, and the knowledge of form and structure gained in botany and zoology may be of fundamental value in relation to art activities and art appreciation.

4. History, English, and related subjects make use of pictures and other visual aids to make descriptions and events clearer.

5. Literature, music, and dancing, like art, are studied for appreciation and expression. In each of these such principles as unity, rhythm, and subordination are present.

Stability of art. Styles in art change continually, just as styles in dress change. These changes occur in response to changes in ways of thinking and in the desires and aspirations of a group of people. But the scientific principles underlying every art remain the same, although additional study may discover hitherto unknown laws that will aid in giving a richer and more accurate interpretation of those already in use and recognized. The codifying of various scientific discoveries, proved in turn by the application of the scientific principles of analysis and synthesis, has resulted in a science.

In painting and music, every artist has an expression

somewhat individualistic in nature. Among artists of a particular school there may be a fair degree of similarity of expression, while in other schools the situation may be entirely different. Yet, underlying the activity of each are the basic laws of science applicable to art—harmony, balance, and proportion. These laws form the science of a particular art. Thus, there can be no art until certain scientific principles are discovered, connoting that the inner artistic nature that is highly developed in some is itself based on natural, inviolable laws, even though such laws have not been discovered.

However, studies show that there are certain psychological elements present in æsthetic appreciation. Ruckmick concludes from his studies of this problem:

The æsthetic impulse finds satisfaction (*a*) in certain space relationships where they tend to create a source of balance or lessen tension; (*b*) in balance in that it creates an experience of stability and equilibrium; (*c*) in rhythm when it directs attention or favors perception by unifying; (*d*) in emphasis when it lessens the strain of attention by attracting, fixing, directing, or holding attention.⁸

Individual differences in art ability. There are a number of children who are endowed, even prior to the beginning of their school careers, with the ability to choose discriminately between harmonious perspectives and non-harmonious perspectives. Some children choose the art expressions more wisely than do others. Some appear to achieve greater æsthetic results even before instruction than others. That a wide range of difference exists in the appreciation, understanding, and performance of art activities is well recognized by teachers of art. However, the number of children possessed with unusual ability in art

⁸ Ruckmick, C. A., "Studies in the Psychology of Art," *Psychological Monographs*, 1933, Vol. 45, No. 1, p. 182.

is rather limited; they are the exception rather than the rule.

The Division of Art of the Baltimore Department of Education makes an annual survey in an effort to locate those pupils of the junior-high-school age who possess unusual ability in art. The list of pupils thus found is presented to the art departments of the senior high school. The work in art of the senior high school is concerned in part with the continuation of the developmental art work begun in the junior high school. An attempt is made at articulating the work and providing for individual differences. Various types of courses, such as commercial art, costume designing, illustration, architecture, art appreciation, and the like, are offered for students of various interests, needs, and abilities.⁹

Vogt¹⁰ points out that the motivation of self-will and determination, as well as training in technique, is important in the development of the ability for sketching. Motivation is important in the determination of the amount of time spent and the degree to which one becomes identified with the situation at hand. Not only will the student who is motivated and driven by self-will develop skill, but he tends to develop personality traits and interests definitely related to art activities with which he has been connected.

Imagination and drawing. Drawing is very closely related to the imagination. The child's drawings represent a great deal of vivid imagination concrete in nature, but certainly, for the adult, not closely related to the

⁹ Winslow, Leon Loyal, "Orienting Art in the Educational System," *Educational Administration and Supervision*, 1931, Vol. 17, pp. 603-611.

¹⁰ Vogt, W., "Zur Frage des Trainings," *Int. Zsch. f. Indiv. Psychol.*, 1932, Vol. 10, pp. 146-151.

actuality. Drawing is a symbolic representation of the original in a very concrete and vivid manner. The early period of the child's drawing is of the scrawl type, in which various lines represent facts to the child although few facts are to be gathered from them by the adult. The second stage of the child's drawing is schematic in nature. These schematic drawings gradually become more elaborate and certain details are added to the outline. These are interesting and obvious parts of the older child's visual experience; but in general he does not place these parts in their true relation to each other. The drawing of the human form may place the arms and legs as prongs running from the face, while the trunk may be entirely omitted. This is not an important and interesting part of the human being, according to the child's experiences. Concerning the arrested development of schematic drawing, Judd says:

Schematic drawing serves the purpose of recording ideas much more fully and satisfactorily than does the scrawl. It is the limit of achievement in the graphic arts for most people. The reason why most people stop developing in drawing at this level is one of the important lessons to be learned from educational psychology. As soon as a child is able to make a schematic drawing, he begins to make comparisons of his sketches with the objects which they are supposed to represent. He becomes conscious of the inadequacy of the drawings. Sometimes he finds that his drawings are subject to the scrutiny of those about him and that his efforts are criticized as inadequate or even ridiculous. . . . The discouragement following social or personal criticism becomes a crucial turning-point in the child's development.¹¹

Measurements in art. Owing to the fact that the general aim of art education is the development of attitudes

¹¹ Judd, C. H., *Psychology of Secondary Education*, Boston, Ginn and Company, 1927, p. 272.

and appreciation rather than the acquisition of factual knowledge or the development of sensorimotor skills, it is very difficult to measure the results of a program of work in art. Scientific workers not versed in the meaning and significance of a course of study in art are often prone to measure the results of various programs or experiments by using the material phase of the child's creative activities, rather than the change in attitudes and appreciation of the child, as the basis. The first tests and scales produced for the measurement of the outcomes of a program in art education were in actuality constructed for the evaluation of drawings. The results thus obtained may be objective in nature, but they fail to measure those qualities in the developing child which modern art education aims to develop. Furthermore, modern art education is designed to encourage a richer and more creative imaginative life; this too has not been measured by the tests and scales available. There is a need for tests in art that will recognize the interrelation of the emotional, sensory, and intellectual development of the child due to his experiences in art activities.

The *United States Bulletin on Instruction in Music and Art* lists the following art tests available for use in the secondary schools:

1. Aesthetic judgment or art appreciation tests:

Norman C. Meier and Carl Emil Seashore. The Meier-Seashore Art Judgment Test. Bureau of Educational Research, University of Iowa.

Margaret McAdory. McAdory Art Test. Bureau of Publications, Teachers College, Columbia University, New York.

Erwin O. Christensen. A Test in Art Appreciation. Harvard University Press. (Out of print. New edition in process of revision.)

2. Drawing scales:

Linus Ward Kline and Gertrude L. Carey. *A Measuring Scale for Freehand Drawing*. The Johns Hopkins Press.

3. Art ability tests:

A. S. Lewrenz. *A Test of Fundamental Abilities in Visual Art*. Research Service Co., Los Angeles, Calif.

L. W. Pressey and Alma Jordan Knauber. *Art Ability Test (for adults)*. Ohio State University.¹²

Thought Problems

1. How is music a force in social behavior? Illustrate.
2. What was the earliest type of music? Of art?
3. What is meant by "musical talent"?
4. Upon what factors does one's enjoyment of fine arts depend?
5. Of what value are fine arts as a language? How are they a language?
6. How are music and art related to the present-day aims of education? How should this relation affect the nature of the instruction?
7. What are some of the difficulties encountered in measuring fine art aptitudes?

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¹² *Op. cit.*, pp. 64-65.

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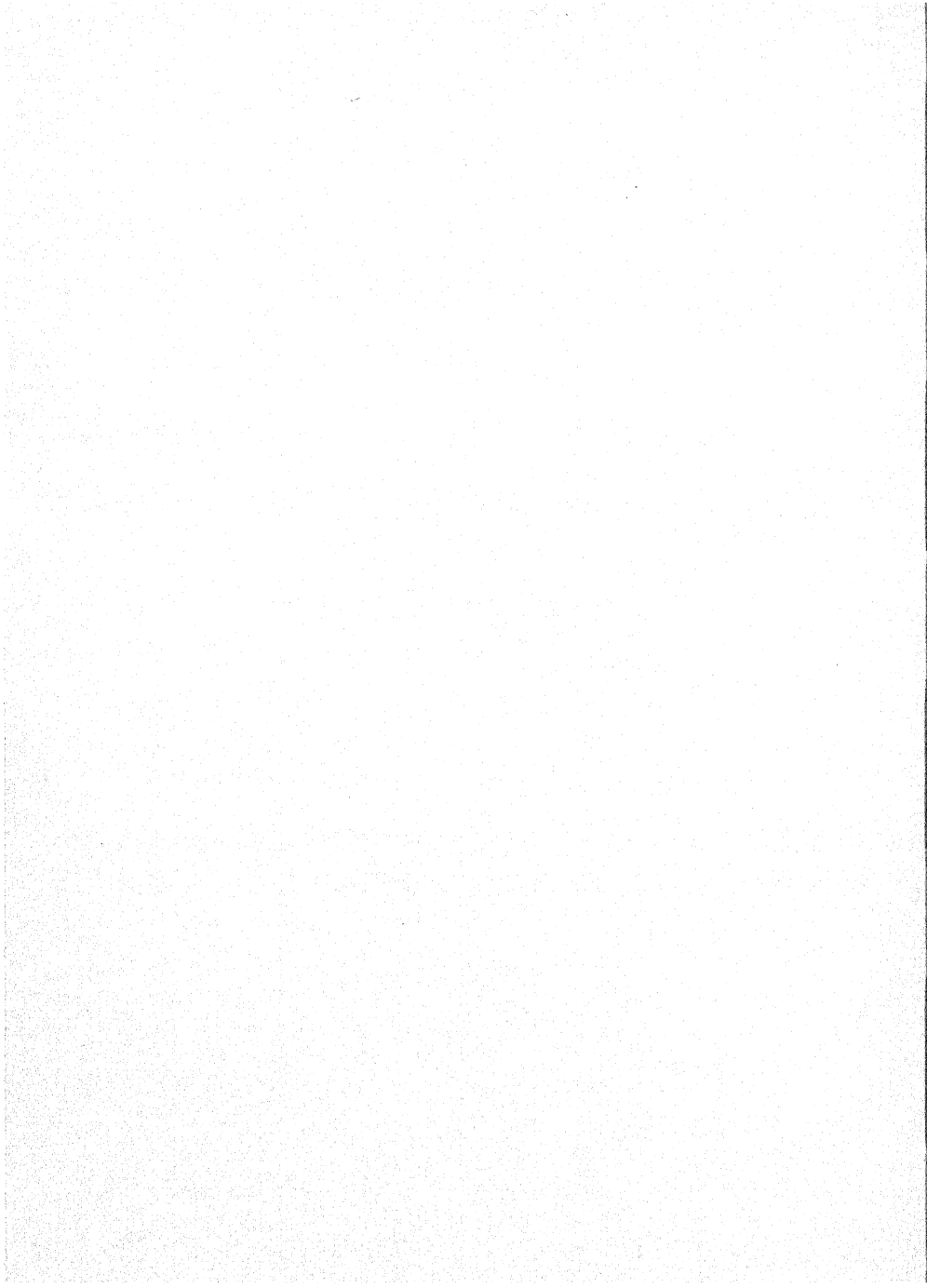
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For some recent references on instruction in music and art, see: Koos, L. V., *et al.*, "Selected References on Secondary School Instruction," *The School Review*, 1934, Vol. 42, pp. 222-226, and 1935, Vol. 43, pp. 221-224.



PART III

Personality Development

CHAPTER XIX

Measurements in Secondary Education

The development of the testing movement. Although individual differences were recognized rather early, as he points out, Peterson says: "Wherever individuals came into close proximity it was inevitable (from the very first) that certain differences among them would be recognized, and insofar as this is true the limitations of the personal wills and of other abilities would of necessity be implied."¹ The criteria used in studying intelligence prior to the advent of the studies of Sir Francis Galton (1822-1911) were in the main unscientific and nonvalid.

An example of such criteria is phrenology, developed by F. J. Gall (1757-1828) and based upon the principles: (1) the various faculties which had been suggested earlier by Wolf are located in rather definitely charted areas of the brain; and (2) the size of these areas is an indication of the presence or lack of a superior faculty in that location. Thus, a head so shaped that it projected in a certain direction would indicate a superiority in the faculty related to that area. Although phrenology has been discredited in scientific circles, the study of physiognomy has developed with a somewhat similar general notion. Katherine Blackford is usually associated with this method of analyzing intelligence. According to this doctrine, facial contour, pigment of skin or eyes, color of hair, and

¹ From Peterson, Joseph, *Early Conceptions and Tests of Intelligence*, p. 19. Copyright 1925 by World Book Company, Yonkers-on-Hudson, N. Y.

so forth, would denote a special type of personality. This general notion has received rather wide acceptance, although scientific studies have tended to discredit it. Likewise, the criminal type and the socially or economically inferior have been branded as definitely inferior in intelligence. The generalizations made relative to these types are not tenable when subjected to the acid test of carefully controlled selection and quantitative treatment.

Galton devised various sorts of sensory tests, which he used in measuring sensory acuity, sensory discrimination, and sense perception. Although these tests were measures of sensory performances, they were definitely concerned with what an individual does rather than with some physical condition or relation associated with a particular personality. Testing of these perceptual differences required performances that involved some degree of mental activity and thus presented a more direct approach to the problem of measuring mental ability. Cattell published the results of some studies conducted by him as early as 1885. In these he used, probably for the first time, the term *mental tests*. In them he describes some of the tests given to Columbia College freshmen, and included among these were a number of sensory tests similar in nature to the ones used by Galton. He also included tests of imagery, afterimage, perception of time, rate of perception, accuracy of observation, and memory. Following these two very important contributions to the field of testing, a number of psychologists interested in the measurement movement made contributions that were destined to play a role in the final production of the first intelligence scale in 1905.

Binet's contribution to measurements can hardly be estimated. His early experimental work was prompted by

the desire to devise tests that would differentiate individuals of varying degrees of ability. The problem of retardations in the schools of Paris presented a fertile field for study and a splendid incentive for work. Binet hoped that after the laggards in the school were differentiated, some sort of training that would aid them in overcoming their mental handicap might be given them. In the attempt to differentiate this group, he devised in 1905 a scale designed to measure degrees of mental ability. Peterson says of the work of Binet and his associate, Henri, that "while they classified the main problems of individual psychology as (1) the study of the extent and the nature of the variations of the psychic processes from one individual to another, and (2) the determination of the interrelations of these various processes in any single individual as to whether they are mutually dependent or whether some are fundamental processes upon which all others depend, it is clear that their interest was really more in the individual than in the processes themselves. What they were after was a series of tests which would bring out most clearly the large differences in ability among different persons."²

The union in America of the two lines of approach represented by Galton's statistical studies and Binet's mental scale has produced much fruit. Although the work of Cattell, already referred to, was in some respects a forerunner of Binet's, yet the productive work of Cattell, Thorndike, Terman, Goddard, and many others has added a great deal to the scientific study of individual differences. The Binet-Simon revised scales of 1908 and 1911 have been models for individual mental scales constructed throughout the civilized world.

² *Ibid.*, p. 97.

The intelligence testing technique was given a great impetus during the World War.

In 1917 psychologists devised for use in the United States army a group scale "Alpha" for literate English-speaking recruits, and a group scale "Beta" for illiterate and non-English-speaking recruits. . . . Shortly thereafter, the use of group tests in surveys of the public schools became frequent. . . . In general, group tests are more frequently used for classification, and individual tests for the analysis of maladjustment. The devising of satisfactory tests for the higher levels of intelligence has necessarily proved difficult, but has attained a degree of success sufficient to cause many American colleges to utilize such tests for the classification of applicants for admission and for other administrative purposes. . . . Terman's scale has nevertheless been by far the most popular of scales for individual testing, and the concept of mental age continues to be employed in a great many other intelligence tests.³

Now that the quantitative analysis of human abilities has risen in spite of many difficulties, the "psychology of individual differences" paves the way for a consideration of persons according to various factors. Educational psychologists have thus come to apply the methods used in the psychological laboratory to problems of intelligence, special abilities, and learning. There is coming forth each year an abundance of materials pertaining to learning and the various phases of measurements in education. For a "bird's-eye view" of the abundance of such materials thus issuing forth, the reader is referred to the yearly summaries presented in the *Psychological Bulletin*.

The standardized tests. These instruments devised for measuring more accurately the abilities of school children are commonly referred to as "standardized tests." By this term are meant tests that are given and scored according to some uniform scheme. The exercises have in most cases

³ Murphy, Gardner, *Historical Introduction to Modern Psychology*, New York, Harcourt, Brace and Company, Inc., 1929, pp. 351-352, 360.

been very carefully selected, the tests have been given to large groups of children of various ages, and averages for the various ages have been obtained. These averages are referred to as the *norms* for the test. The structure of the standardized test is such that the results obtained depend very little if at all upon the one who administers and scores the test. Dictating and copying of problems and directions are eliminated and thus time is saved for both the teacher and the pupil.

Some criticisms have been made of standardized tests since it was found that they are not perfect measuring instruments. However, although they are not perfect, they are distinctly superior to ordinary written examinations in so far as objective work is concerned.

Furthermore, the tests measure the pupils' abilities on a much wider range of performances than do the traditional written examinations and are less subject to error from influencing the one doing the testing through such factors as handwriting, neatness, and organization. Standardized tests should be recognized as of fundamental importance in the evaluation of educational outcomes, but their limitations should be remembered.

Measures of achievement. The secondary-school period has too often been a period during which pupils gathered isolated facts, the acquisition of enough of which enabled them to pass an examination that secured them credit toward graduation. Often, there have been no systematic reviews or examinations to determine if the information thus gathered functions or is even retained. The achievement test has been applied to the high-school program of work in the attempt to determine more exactly the educational level of the pupils and to obtain a more careful analysis of the efficiency of the various phases of learning and teaching. The achievement tests stress the

need of a more permanent and useful type of learning as opposed to one designed for credits toward graduation.

The earlier achievement tests usually provided a single score and indicated the general educational development of the pupil. The more recent achievement tests are more analytical in nature and provide a basis for determining the pupil's needs and difficulties. A splendid illustration of this is the *Sones-Harry High School Achievement Test* designed for Grades 9 to 12. The types of materials presented in each section are as follows: ⁴

PART I. LANGUAGE AND LITERATURE

Section	Section
A. Language Usage	I. Character Sketches
B. Word Meaning	J. Literary Passages
C. Abbreviations and Prefixes	K. Literary Themes
D. Grammatical Principles	L. Technical Language Vocabulary
E. Foreign Phrases	M. Grammatical and Rhetorical Forms
F. Literary Forms	N. Literary Characters
G. Reading Comprehension	O. American and English Authors
H. International Authorship	P. Literary Interests

PART II. MATHEMATICS

Section	Section
A. Fundamentals of Mathematics	E. Geometric Figures
B. Mathematical Concepts	F. Geometric Formulas
C. Interpretation of Graphs	G. Geometric Theorems
D. Functional Relationship	H. Mathematical Formulas

⁴From *Sones-Harry High School Achievement Test, Manual of Directions*, p. 3. These topic headings do not appear in the revised edition of this *Manual*. Copyright 1929 by the World Book Company, Yonkers-on-Hudson, N. Y.

PART III. NATURAL SCIENCE

Section

- A. Natural Sciences
- B. Science Processes
- C. Classification
- D. Science Principles
- E. Numerical Values
- F. Extremes in Nature

Section

- G. Transformation of Energy
- H. Science Stories
- I. Science Instruments
- J. Scientists

PART IV. SOCIAL STUDIES

Section

- A. Civic Information
- B. Civic Information
- C. Famous Americans
- D. Background of Civilization
- E. Events in American History

Section

- F. Characters of History
- G. International Affairs
- H. Place Geography
- I. Economists
- J. Economic Vocabulary

Percentile norms are established for the general achievement and subject matter tests. A percentile score gives the percentage of pupils in the group that a given pupil excels. If on the "Language and Literature" part of the *Sones-Harry High School Achievement Test* a Grade 10A student obtains a score of 63 points, his percentile score would be 80, since this score exceeds the percentile scores of 80 per cent of the students of Grade 10A. The percentile score 50 is the median score, and a pupil whose percentile score is above 50 is above the median for this group. If a pupil's percentile score is below 50, he is below the median for his group. These percentile scores may be expressed in terms of age or grade. Norms expressed in percentile scores give a very useful basis for determining a student's relative rank on the test, and such a means of expressing scores is commonly used in connection with the various high-school achievement tests.

New-type tests. New-type tests differ from traditional tests in that the former are more easily scored and, if the directions are followed, with the same value by different individuals. They differ from standardized tests in that definite grade norms, score values, reliability, and validity are known for the latter.

Some of the new-type tests are: single-answer or recall tests, multiple-answer tests, alternative tests, completion tests, and matching tests. Certain principles of construction and scoring should be observed by those using new-type tests. In the construction of an objective test, the first consideration should be: What is the major objective? The aim or objective for giving the test will determine to a large extent the type of test items to be used as well as the time to be consumed. If the objective is to arrive at an estimate of the number of facts learned or memorized, then a few simple completion items or questions that can be answered by one or two words will suffice. But if the purpose is to measure the ability to relate and understand the meaning and significance of factual materials, another type of exercise will be essential; and if the purpose is to measure the ability to carry on reflective thinking with the factual materials, still another type of exercise will be needed. Again, any test should be preceded by definite directions as to what the pupils are to do. It is necessary to avoid any ambiguity in the wording of the directions for the taking or in the items of the test. Unless the teacher gives a good deal of attention to this matter, ambiguous statements will be unnoticed until the papers are graded, when it will be discovered that some of the statements may be interpreted in more than one way and that some pupils have interpreted them in a way not thought of by the teacher.

Another point to consider in making new-type tests is

the sampling. Generally a sufficiently large number of items should be included so that all the more important points covered in the subject matter on which the testing is based are included. If this is not done, the sampling should be made very carefully, so that items equal in importance shall receive equal emphasis.

Certain types of examinations are much easier to construct than others. However, it is a good policy to use a variety of new-type tests during the course. After a little practice in constructing objective tests, the teacher is better able to gauge the difficulty of the test. It is a fundamental principle of testing with new-type tests that a test should be easy enough for every pupil to make some score and too difficult for any pupil to make a perfect score—at least, very few should be able to do so. As a rule, it is desirable to construct tests which will give a wide range of scores. For this reason, a large number of test items varying from fairly easy to very difficult for the class should be included, unless more frequent tests are given. In that case, the results from all the tests should be combined. In scoring the test papers, it is customary to give one point for each test item. In most cases, scoring can be made much easier by the use of a sheet of paper on which the correct responses are written. This sheet may be used as a key.

a. *Single-answer or recall tests.* This is the type of test probably used most frequently. It is the simplest and usually the most easily constructed. If the teacher is unable to make a copy of the test for each pupil, this is probably the best test for him to use, since it can be given orally. The teacher reads a question, allows time for the pupils to write an answer, and passes on to the next question.

b. *Multiple-answer tests.* Generally, the multiple-answer test requires the pupil to select one answer as the correct one out of a number of possible answers furnished. This type of test is constructed in many ways and very widely used.

c. *Alternative tests.* In the alternative test, the pupil is required to choose between two responses. This test has been criticized by a number of workers because it allows for a large element of guessing. Also, no very satisfactory method of scoring it has been found. Usually, the result of subtracting the number of wrong responses from the number of right ones is taken as the pupil's score.

d. *Completion tests.* The completion test is probably the oldest of the new-type examinations. It has a number of decided disadvantages. Generally, one point is given for each blank filled in correctly.

e. *Matching tests.* In this type of test, two sets of facts are presented and the pupils are told to match items in one set with items from the other set.

f. *Scales.* Scales have been developed as an aid in making more accurate evaluations of measurements in certain fields, especially composition and handwriting. In the scale, each one of various samples is given the numerical value of that sample which it most nearly equals in general merit. Greater accuracy is secured when several judges rate the papers and the average of the ratings is taken.

Validity of new-type tests. Price ⁵ studied the validity of various types of tests used in measuring achievement

⁵ Price, R. A., "A Study of the Validity of Three Types of Objective Tests in the Teaching of History," *Second Yearbook of the Council for the Social Studies*, Philadelphia, McKinley Publishing Company, 1932, pp. 118-131.

in the social studies. His results show that multiple-choice items of four responses correlate slightly higher with semester grades than does the true-false type of test. A further study of the multiple-choice test was made by Sims and Knox.⁶ These experimenters gave four forms of the *Thorndike Test of Word Knowledge* in four ways. One form they gave as a regular printed test (illustrating visual presentation). Three other forms they presented orally, using in one case three alternatives, in another four, and in a third five. Their findings show that the multiple-choice test is only slightly more difficult when presented orally than when presented visually. Furthermore, in harmony with what one would expect, they show that the use of five alternatives is superior to the use of three or four. Briggs and Armacost⁷ compared the oral and visual methods of presenting true-false statements. Their results show that the two methods are about equally reliable.

The validity of the various standardized tests has been arrived at in most cases through careful study, selection, elimination, and revision of the various items. In most cases, the tests have been tried out on various groups and after each trial period checked against some standard and further revised accordingly. The positive correlations constantly found between the standardized test scores and other measures indicate that these instruments are valid, that is, that they are measuring to a rather large extent that which they purpose to measure. Most tests have been carefully evaluated in order that certain elements,

⁶ Sims, V. M., and Knox, L. B., "The Reliability and Validity of Multiple-Response Tests When Presented Orally," *Journal of Educational Psychology*, 1932, Vol. 23, pp. 656-662.

⁷ Briggs, T. H., and Armacost, G. H., "Results of an Oral True-False Test," *Journal of Educational Research*, 1933, Vol. 26, pp. 595-596.

such as lack of clarity, tricky exercises, and the like, all of which would tend to lower the validity of the tests, might be eliminated.

Teaching value of new-type tests. It was pointed out in the discussion of motivation in relation to learning that objective tests may be used as a means of enabling students to chart their progress and discover their specific difficulties. Recent studies of this problem have given varying results, a fact which indicates that the value of such tests will depend to a large degree upon the use made of such test results by the teacher and the pupil. Tests constructed and used for the purpose of increasing learning efficiency will serve as an aid in the learning process to a larger degree than will tests designed wholly for the measurement of the comprehension of the subject. Lee and Symonds, on the basis of studies that have been made on this problem, propose the following techniques as a means of increasing the instructional values of tests:

1. The giving of multiple-choice and essay questions as pre-tests.
2. Using objective tests as assignments.
3. Informing pupils of their results on tests.
4. The use of satisfying after effects.
5. Having the pupils correct errors on their own papers.

In addition to these findings the previous summary indicated that informing pupils that a final examination is to be given, giving a number of short tests throughout the course, and having the pupils score their own papers add to the instructional value of tests.⁸

Diamond⁹ found from a study of the preferences of

⁸ Lee, J. M., and Symonds, P. M., "New Type or Objective Tests: A Summary of Recent Investigations (October, 1931—October, 1933)," *Journal of Educational Psychology*, 1934, Vol. 25, p. 165.

⁹ Diamond, L. N., "Roads to Creative Testing in High School Science," *School Science and Mathematics*, 1933, Vol. 33, pp. 539-543.

high-school students that the objective tests are preferred by students. He found further that the students examined preferred tests in which the scorings were of such a nature that their records could be kept graphically from time to time. They also showed a greater preference for tests made out by other pupils.

Prognosis. The problem of prognosis in high school is concerned primarily with determining as accurately as possible the intelligence level, the special aptitudes, and the peculiar personal factors or other elements and ascertaining their importance in predictions relative to outcomes in secondary education. The specific questions raised relative to prognosis are as follows:

(a) To determine the intelligence quotient or level below which success in a particular study is quite uncertain.

(b) To determine the average scholarship level below which success in a special study is problematical.

(c) To test the special abilities and disabilities involved in learning a school subject and on the basis of the results to predict future progress with a greater degree of accuracy.

(d) To measure the achievement and progress at the close of a unit of time for work and thus determine whether a pupil has the capacity and drive to profit by further study and, thus, whether or not the pupil should be encouraged to continue it.¹⁰

If some means can be devised beforehand for revealing through the correlation technique those students who will probably meet with success and those who are likely

¹⁰ See Henmon, V. A. C., *Prognosis Tests in Modern Foreign Languages*, Publications of the American and Canadian Committee on Modern Languages, Vol. 14, p. 5.

to fail in their high-school work, much time and effort on the part of both pupils and teachers can be saved. Furthermore, such a prediction would add to the general morale of the school and be a saving to the school community. The means of effecting such a saving through predictions must be some prognostic instrument. The extent to which a test will indicate future failure or success is indicated by the size of the correlations between the test scores and success in the subject. The *Orleans Algebra Prognosis Test*, the *Orleans Geometry Prognosis Test*, the *Orleans Solomon Latin Prognosis Test*, and the *Luria Orleans Modern Language Prognosis Test* are examples of tests designed to aid in the prediction of success and failure among high-school pupils.¹¹

TABLE LIX

NUMBER OF STUDENTS IN THE HIGHEST AND LOWEST
QUARTILES IN INTELLIGENCE ENROLLED IN VARIOUS
HIGH-SCHOOL SUBJECTS. (*After Powers.*)

	<i>No. in 4th Quartile of Intelligence</i>	<i>No. in 1st Quartile of Intelligence</i>
Advanced Algebra and Solid Ge- ometry.....	20	2
Latin.....	58	17
Natural Science.....	69	39
Spanish and French.....	46	27
Manual Training and Mechanical Drawing.....	28	25
History.....	101	109
Commercial Subjects.....	44	69
Domestic Art.....	36	66

Powers gives some rather interesting data showing the operation of intelligence in the selection of high-school subjects for study. These data are presented in Table

¹¹ "Use of Tests in Studying School Problems," *Test Service Bulletin*, Yonkers-on-Hudson, N. Y., World Book Company, No. 22, p. 5.

LIX. According to these data, students in the highest (fourth) quartile of intelligence usually select the more academic types of materials, while those in the lowest quartile are more inclined to select the more vocational types.¹² These findings are in harmony with those presented in Chapter VII dealing with the interests of high-school pupils. They are, furthermore, in harmony with findings from other studies.

Diagnostic testing. A test may give a single score that provides a reliable basis for estimating achievement or predicting future success without giving any information about the pupil's deficiencies and superiorities. For an analysis of the student's ability in a subject, the test must be made up of several parts, each part measuring some component part of the subject. The general achievement of the pupil can be obtained from the composite score made in these various parts. The pupil's scores on the several parts of the test will provide a means for ascertaining those phases of the work where he needs further help. Remedial work can then be directed to these points. Such an analysis is very important for a knowledge of the phases of a subject in which a pupil needs special help.

The achievement quotient is of value for diagnosing whether a pupil is doing what one would expect of him on the basis of his intelligence. The achievement quotient (A. Q.) is the ratio of mental age to chronological age; that is, it is obtained from the results of educational and intelligence tests expressed in terms of age. If a pupil's standing on an educational test gives him the same educational age as the mental age given him by the mental test, his achievement quotient will be 100. He is

¹² Powers, S. R., "Intelligence as a Factor in the Selection of High School Subjects," *School Review*, 1922, Vol. 30, pp. 452-455.

then said to be doing normal work for his mental level.

Whether the A. Q. or some other device is used in ascertaining the industry of the pupil, it is a significant factor that *any noticeable discrepancy between mental ability and educational performance is an important diagnostic indication*. It is pointed out by Wilson that the accomplishment quotient is misleading in that it actually tends to penalize the child of highest intelligence.¹³ It is pointed out that a child with an I. Q. of 145 will find it extremely difficult to perform educationally up to his mental level. Especially is this true when standards, methods, materials, and general school activities are set up for pupils with nearly average mental ability. However, it should again be asserted that, although the A. Q. doesn't tell us what is wrong, it does provide us with evidence that the pupil is not performing educationally as well as he should on the basis of his mental ability.

Homogeneous grouping of students. The problem of homogeneous grouping grew out of the studies that have been made in evaluating individual differences in mental performance. Within recent years, a large number of studies have been made comparing groups that are classified according to mental ability or scholastic attainment with more heterogeneous groups. The survey of Turney, in which sixty-six studies were reviewed and evaluated, gives some interesting conclusions relative to these studies. He concludes from these studies:

1. Most of the studies purporting to evaluate ability grouping have proved nothing regarding ability grouping but have only added evidence bearing upon the nature and extent of individual differences.

¹³ Wilson, W. R., "The Misleading Accomplishment Quotient," *Journal of Educational Research*, 1928, Vol. 17, pp. 1-10.

2. Most of the experimental attacks upon the value of ability grouping have failed to evaluate the chief claim for it, i.e., the possibility of adapting content, method, or time.

3. There is some reason to believe that ability grouping can best be exploited by using measures of mental ability as the major basis for sectioning.

4. The experimental literature indicates that more often than not pupils do better in homogeneous groups than in heterogeneous groups.

5. There is a fairly strong indication that when efforts are made to adapt the means and materials of instruction to the needs of different levels of ability, better achievement occurs in homogeneous than in heterogeneous groups.

6. In the experimental situation where there is no special effort made to adapt content or method the average and lower groups appeared to benefit more often than the higher groups.

7. There is some evidence, not conclusive, that ability grouping promotes motivation of the pupils to increased effort.

8. There is no adequate information as to whether the majority of teachers really find it easier to teach homogeneous groups.

9. There is no acceptable evidence as to the effect upon the mental hygiene of the child.

10. There is some evidence that homogeneous grouping reduces failure but it is not conclusive.

11. There is no direct evidence that elimination is reduced as a result of homogeneous grouping per se.

12. The true evaluation of ability grouping must be deferred until adequate experimental attacks have succeeded in measuring its alleged advantages.¹⁴

General educational uses of tests. Educators have constantly emphasized the need for objective testing instruments and have constantly attempted to point out the advantages of the standardized and new-type tests. They have not, however, always succeeded in presenting definite means for the use of these in the improvement of instruc-

¹⁴Turney, A. H., "The Status of Ability Grouping," *Educational Administration and Supervision*, 1931, Vol. 17, pp. 122-123.

tion. Too often the tests are used as a further means of helping to set up standardized and, thus, uniform requirements. One of the writers is acquainted with a school superintendent who relied 100 per cent on standardized tests for the promotion of pupils. One pupil was thus kept in the second grade four years. At the end of this period, she was beyond the compulsory school age limit (14 years) and dropped out of school. This was several years ago, and (on the basis of what the writer knows of the case) if the State had had a compulsory school law of 18 years and that superintendent had remained in his position without a change of attitude, this pupil would probably still be in the second grade.

Such a use of standardized tests is an abuse. Standardized tests should not be set forth primarily as an administrative device. They may aid in relation to administrative activities, but their greatest values will be found in relation to instruction. Even here there is sometimes present the attitude that the mere giving of standardized tests will improve achievement. This is not true, for they merely give information which, if wisely and discreetly used, will lead to an improvement of the school activities.

The most frequent uses made of tests, as presented by Hildreth, are:

1. For administrative purposes, including pupil classification and grade placement, comparisons of groups and schools, determination of the suitability of techniques and procedures, obtaining data for time allotments, determining bases for promotion and obtaining achievement data for reports to parents, administrators, and boards of education.

2. For the supervision of instruction, involving estimation of pupil status and progress, setting up of goals, measuring the attainment of goals, ascertaining suitable methods of teaching for the achievement of the standards set, determining necessary variations in emphasis in the course of study

for different classes and schools, and determining instructional strength or weakness in teachers.

3. For individual pupil analysis and guidance. The determination of pupil capacity, analysis of defects and difficulties, the determination of special abilities and individual differences.

4. For obtaining pupil data to be used for research purposes.¹⁵

Thought Problems

1. Illustrate concretely the thesis, "The testing program should be directly related to the instructional program."

2. Why does the recasting of the essay type of test usually tend to increase its reliability?

3. List (a) some of the major advantages of the new-type tests; (b) some disadvantages.

4. What values do you see in the underlying principle of the A. Q.? What are some errors that must be guarded against in the use of the A. Q.?

5. What are the values in knowing a pupil's I. Q. upon his completion of the elementary-school course? Upon his completion of the high-school course?

6. Formulate the advantages and disadvantages of group tests.

7. Are there different types of intelligence? Explain.

8. Outline a program of measurements for a high-school system. State the size of the high school and the characteristics of its program.

9. How can the validity and the reliability of a test be determined? What is the importance of each?

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¹⁵ From Hildreth's *Psychological Services for School Problems*, pp. 54-55. Copyright 1930 by World Book Company, Yonkers-on-Hudson, N. Y.

496 Measurements in Secondary Education

Kinney, L. B., and Enrich, A. C., "A Summary of Investigations Comparing Different Types of Tests," *School and Society*, 1932, Vol. 36, pp. 540-544.

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CHAPTER XX

Educational Growth

The factors involved in the learning process in connection with the various school subjects have already received special attention. During the elementary-school period, learning is of a simpler nature involving simple associations and a great deal of mere memory materials. As the individual matures, if he has the average mental ability, he tends to substitute more logical associations for the simpler types of mental activity. As the average individual reaches mental maturity, there is an increase in his attentive process and his memory span. The problems involved in mental growth received special attention in Chapter IV. The materials of this chapter are closely related to those dealing with the growth of mental ability. The major difference is that the emphasis here is on the growth in the amount of educational materials that have been acquired, retained, and unified in the child's behavior activities. In the chapter dealing with mental growth, the emphasis was more in the direction of the nature and characteristics of mental development in relation to the secondary-school period. Some subordinate problems that will be studied here are: the nature of composite growth curves, educational growth in the various school subjects, the curve of forgetting, some factors involved in retention, the relation between mental ability and achievement, and other related problems.

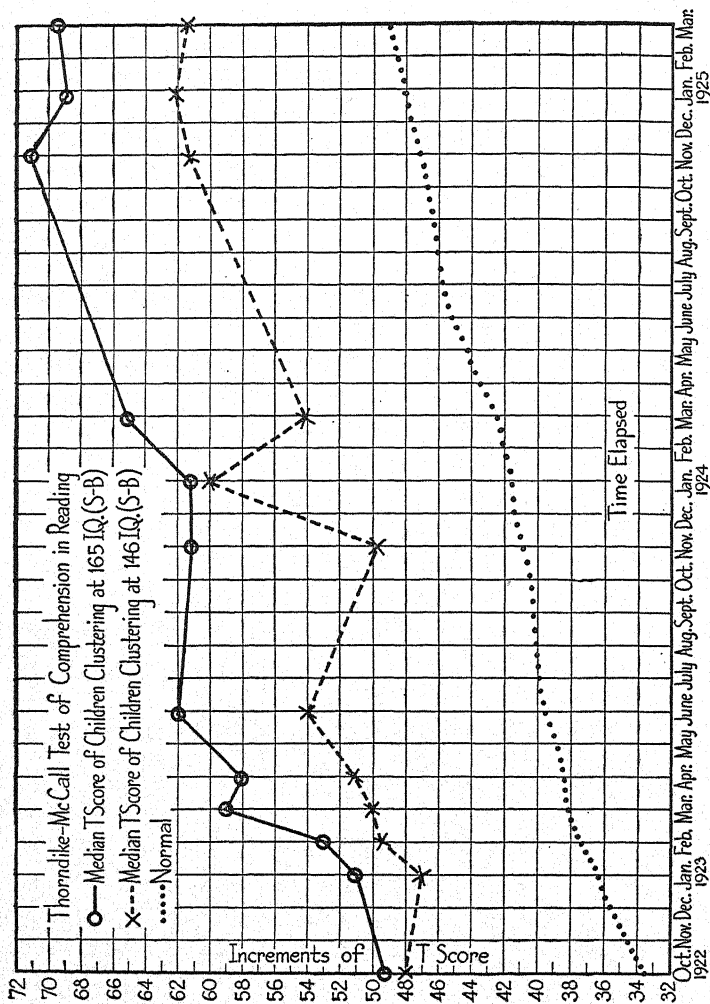


Fig. 14.—Educational Growth Curves for Reading Comprehension for Two Groups of Superior Children. (After Hollingworth and Cobb.)

Composite growth curves. Growth curves for groups of children in the various school subjects have been established for various types of subject matter. Figure 14 gives some interesting growth curves for two groups of superior children used in a study by Hollingworth.¹ The average age of the lower group was 134.75 months while that for the higher group was 136.20 months. In this study these superior children were tested for reading by a specific test at varying intervals during a period of three years. The solid line represents the progress made by a very superior group (a group whose I. Q.'s clustered around 165), while the broken line represents that of a superior group whose I. Q.'s clustered around 146. An analysis of these curves shows a distinct and continuous superiority in the progress of the very superior group over that of the superior group. These curves are curves of growth in a specific function.

The norms of any well-standardized educational test when graphed will give an average learning curve for children in general for the function or functions tested. Norms represent the averages for a large group of children for different ages or grades. If the averages for the various ages are given, we have age norms; whereas, if the averages for the various grades are given, we have grade norms. Curves of educational growth based on norms represent what children of the various ages or grades actually do under present-day school conditions rather than what they could do if they were expending a maximum of effort under more favorable school conditions.

¹ Hollingworth, Leta S., and Cobb, Margaret V., "Children Clustering at 165 I. Q. and Children Clustering at 146 I. Q. Compared for Three Years," *The Twenty-Seventh Yearbook of the National Society for the Study of Education*, Public School Publishing Company, 1924, p. 14.

A growth of achievement curve based upon norms for the *New Stanford Achievement Test* is presented in Figure 15. This curve shows the average number of points scored

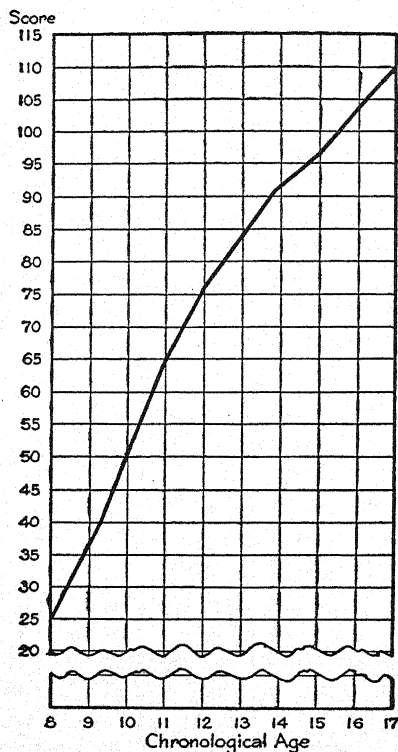


Fig. 15.—Growth in Educational Achievement from Age to Age. ("New Stanford Achievement Test" Age Norms.)

for each age level for the composite of school subjects on the *New Stanford Achievement Test*. This curve, being an average learning curve as well as a composite curve, is more uniform than most curves for educational growth. It is also different from the other curves which we have been considering in that it is derived from measurements of different groups of children taken at different periods.

The curve takes no account of those children who drop out; however, this factor would not be important prior to the age of 15 or 16, since the major portion of children of all ages remain in school until then.

a. *Vocabulary growth.* The study by Pressey and Moore² was designed to reveal how many technical words of mathematics the pupils had mastered. The experimenters selected 106 words from arithmetic, 49 from alge-

TABLE LX

MEDIAN NUMBER OF WORDS USED IN ARITHMETIC,
ALGEBRA, AND GEOMETRY WHICH WERE RECOGNIZED
BY PUPILS IN GRADES 3-12

Grade	Arithmetic	Algebra	Geometry	Total
III.....	16	0	0	16
IV.....	31	0	0	31
V.....	42	0	0	42
VI.....	59	0	0	59
VII.....	71	3	13	87
VIII.....	84	7	19	110
IX.....	89	22	24	135
X.....	89	21	51	161
XI.....	89	13	47	149
XII.....	88	11	46	145

bra, and 88 from geometry. The arithmetic test was given first, starting in the first grade. After some preliminary trials, the algebra and geometry tests were given, starting in grade seven and continuing through grade twelve. The tests were given in five different school systems varying in size. The findings are presented in Table LX. This shows a gradual and continuous growth in the ability to recognize the meaning of mathematical terms. The conclusion was that the greatest trouble in mathematics is due to not understanding many simple terms.

b. *Growth in language skills.* Seaton gathered data

² Pressey, L. C., and Moore, W. S., "The Growth of Mathematical Vocabulary from the Third Grade through High School," *School Review*, 1932, Vol. 40, pp. 449-455.

on errors made in written work by pupils in several elementary and high schools and in various college classes.³ Figure 16 shows the decrease in errors in capitalization, sentence structure, punctuation, and grammar from the third grade to college. The figures at the bottom of the chart show the grades; those at the left indicate the errors

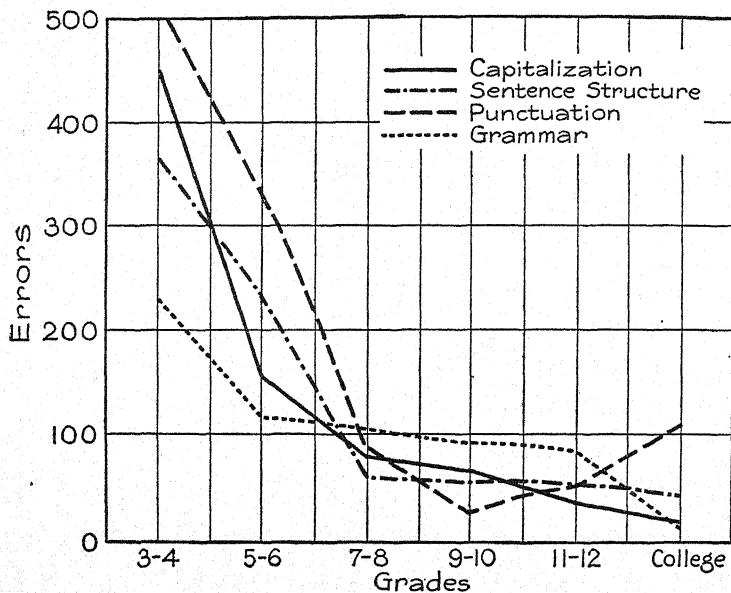


Fig. 16.—Decrease in Errors in Capitalization, Sentence Structure, Punctuation, and Grammar from the Third Grade to College. (After Seaton.)

of each type per 10,000 words. Probably the most striking conclusion to be drawn from this graph is that most of the progress in the elimination of errors is made in the elementary grades. Most progress noted in high-school and college work could be attributed to the fact that the poorer students are constantly dropping out of school.

³Seaton, J. T., "Problems of Learning in English Composition," doctor's dissertation, The Ohio State University, 1929.

However, the factor of the increasing complexity of sentence structure with educational advancement would cause an increase in errors were there no educational growth or selective factors operating. The curves suggest that the mechanics of English composition, like other tool operations, is most effectively handled during the earlier school years. It is at this formative period that basic tool habits are formed. Of course, when the pupil meets a more difficult sentence situation, he should be given further instruction in the language structure.

TABLE LXI

REVISED GRADE NORMS FOR "HAGGERTY READING EXAMINATION: SIGMA 3"

Grade.....	5	6	7	8	9	10	11	12
Score.....	40	54	68	80	93	104	112	118

c. *Growth in reading.* The *Haggerty Reading Examination* is valuable in that it combines in a short booklet a vocabulary test, a sentence reading test, and a paragraph reading test. It also has the advantage of measuring reading ability through a wide range—from the fifth grade to the twelfth. It may also be used with college classes.

This test is, moreover, useful for diagnosis, since it attempts to measure several factors involved in reading ability. The test has a high degree of reliability. Growth in reading ability on the *Haggerty Reading Examination* is indicated by the norms presented in Table LXI.⁴ According to the data of this table, there is a gradual and continuous growth in reading skill throughout the junior-and-senior high-school period. However, the factor of elimination in high school has not been taken into consideration, since these tests are made on different

⁴Haggerty, N. C., *Haggerty Reading Examination, Manual of Directions*, p. 38 (p. 6 of rev. ed.). World Book Company, Yonkers-on-Hudson, N. Y. These norms are reproduced by special permission of the publishers.

pupils for the several grades. If allowance were made for this, less growth would be found from grade to grade.

Retention of subject matter. Besides the growth in ability in various subjects, the problem of the retention of subject matter has been the object of study on the part of those interested in educational growth. This problem looms as very important in the light of the general practice of basing standards of promotion on the immediate recall of materials.

a. *Retention of mathematics.* If the amount of retention of subject matter may be considered as indicating the easy and difficult parts of algebra, C. Woody's⁵ results have bearing on the matter. Woody gave the *Hotz Algebra Scales* to seniors in a large school in Michigan, all of whom had studied algebra in their freshman year and some of whom had elected another year of the subject. The study "shows that the seniors had retained a relatively large amount of the knowledge of the more formal aspect of algebra, but a comparatively small amount of the more complex problem aspect of the subject."

Edna T. Layton⁶ experimented with 51 ninth-grade pupils whose median I. Q. was 114. Another study, related to the retention of elementary algebra over one year during which no mathematics was pursued, shows that ninth-grade pupils tend to retain best a knowledge of factoring, substitution, verbal problems, finding an average, and number problems involving integers and those including fractions and the construction of graphs.

b. *Retention of history.* A reminiscence of one's high-

⁵ Woody, C., "Scores Made by Seniors on the Hotz Algebra Scales Compared with Scores made by High School Students Taking Algebra," *School and Society*, 1922, Vol. 16, pp. 303-306.

⁶ Layton, Edna T., "The Persistence of Learning in Elementary Algebra," *Journal of Educational Psychology*, 1932, Vol. 23, pp. 46-55.

school work in history will reveal that, in the attempt to learn the many encyclopædic facts presented, memory work has been adhered to quite commonly. The question of how well knowledge is retained when learned in this manner has caused the various investigators in the field of educational psychology to study more closely the problem of retention. The content and organization of the materials of the social sciences have undergone great changes, as has already been shown. Brooks and Bassett⁷ investigated the amount of American history actually retained by 495 students in Grades VII and VIII of some of the public schools of Baltimore. The tests used were objective in nature and were repeated at four-month intervals following the first testing. The results show that forgetting is more rapid during the first four months after the close of the term in which the history is learned than in any other equal period. Also, pupils who made high scores at the end of the term usually made high scores four, eight, twelve, or sixteen months later, while those who made low scores the first time they were tested usually made the lowest scores on the subsequent tests. High correlations were found between the results at one testing and the results at the end of any other of the various intervals of testing.

c. *Influence of intelligence.* The investigation by Bassett⁸ showed a positive, though low, relationship between retention and mental age, subject preference, and reading comprehension. Higher positive relationships exist between history retention and interest, effort, and

⁷ Brooks, F. D., and Bassett, S. J., "The Retention of American History in the Junior High School," *Journal of Educational Research*, 1928, Vol. 18, pp. 195-202.

⁸ Bassett, Sarah Janet, "Factors Influencing Retention of History in the Sixth, Seventh, and Eighth Grades," *Journal of Educational Psychology*, 1929, Vol. 20, pp. 683-690.

ability. Although intelligence is a factor in retention, Grant⁹ found that it is more important in the retention of meaningful material than in that of meaningless materials.

On the basis of the nature of intelligence as presented in an earlier chapter, one would conclude that in the retention of fundamental principles and laws intelligence would be an important factor. Thus, the more intelligent high-school pupils will understand and remember the science principles taught them and will be able to apply them in later situations. The pupils who grasp general relations will be able to remember such relations to a larger degree than will the pupils who have depended upon a rote memory process.

d. *Sex and retention.* One of the earliest studies of sex differences in the retention of factual materials was made by Cober. He concludes, relative to familiar facts in history and geography, "It is remarkable how much better the results are for the boys than the girls in the various schools tested. In schools where both sexes attend, the results show a higher percentage of correct answers for the boys."¹⁰ In a study by Bassett, 95 boys and the same number of girls from Grades VI and VII were compared for the retention of facts in history for periods of eight and twelve months, respectively. "These groups were equated on interest and effort and ability to pass the standard history. . . ."¹¹ From this study she concludes:

⁹ Grant, M. E., "Some Theories and Experiments in the Field of Memory," *Journal of Educational Psychology*, 1932, Vol. 23, pp. 511-527.

¹⁰ Cober, E. W., "A Study of High School Pupils with a View of Determining the Extent of Recollection of Once Familiar Facts," University of Pennsylvania thesis, 1912, p. 46.

¹¹ Bassett, Sarah J., "Sex Differences in History Retention," *School and Society*, 1929, Vol. 29, pp. 397-398.

- (1) Boys are slightly superior to girls in history retention. The boys maintain this superiority for all the retests after various lapses of time.
- (2) Boys show greater retentiveness for knowledge relative to war and fighting or to some geographical place.
- (3) Girls are superior to boys in retaining history which treats of domestic conditions and home life.

An analysis of the nature of these differences shows the influence of the background experiences and sex differences in interests in effecting differences in retention. It shows that these factors are important items in affecting the retention of materials and are significant in relation to educational and psychological procedures in the study of social science materials.

e. *Speed of learning and retention.* The popular conception "easy come, easy go" has been commonly used in connection with the nature of learning. This conception probably arose as a device for compensation in cases in which the learning process was very slow. Scientific evidence presented as early as 1912 by Norsworthy, 1913 by Pyle, 1914 by Woodworth, and 1916 by Lyon indicated that there is a tendency for the reverse of this generally held conception to be supported.¹²

Norsworthy studied this problem by having 83 subjects study a German-English vocabulary of 1,200 words.¹³ In his experiment the time for all subjects was constant. The learning ability varied from 33 words to 700 words, with the subjects who learned 700 words retaining them to a relatively greater degree than the subjects who had not learned so many words. He found a positive correla-

¹² Hunter, W. S., "Learning: II. Experimental Studies of Learning," *The Foundations of Experimental Psychology* (C. Murchison, ed.), Worcester, Mass., Clark University Press, 1929, pp. 594-595.

¹³ Norsworthy, N., "Acquisition as Related to Retention," *Journal of Educational Psychology*, 1912, Vol. III, pp. 214-218.

tion of .41 between the number of words learned and the number that could be reinstated.

Among the studies which have measured the relationship between the amount of immediate recall ability and the amount of recall ability at a later period, there is a general agreement of a fairly high relationship. Correlation coefficients of .82 and .71 were found by Winch¹⁴ and Gordon, respectively. Gordon's¹⁵ correlation of .71 is also an indication of the relationship between speed of learning and retention. Studies also show that there is a relationship between the amount learned and the amount retained. It appears that those factors which aid learning also aid retention. The method of stimulus presentation and that of stimulus distribution or concentration are factors which would influence both learning and retention.

The rate of forgetting. Retention, positive or negative, has been a subject of great interest to psychologists for many years. Experiments attempting to determine the amount of retention shown by individuals and groups under varying conditions have resulted in as many different curves as there have been experiments. It has been very conclusively shown, however, that the amount of retention is very definitely affected by the conditions of learning. Now, what is not retained in experience is evidently forgotten. This being true, it would follow that forgetting is affected by the conditions of learning inversely as retention is affected.

Then, insofar as there might be numberless attempts to determine the rate of forgetting, one might describe the

¹⁴ Winch, W. H., "Should Poems be Learnt by School-Children as 'Wholes' or in 'Parts'?" *British Journal of Psychology*, 1924, Vol. 15, pp. 64-79.

¹⁵ Gordon, K., "Class Results with Spaced and Unspaced Memorizing," *Journal of Experimental Psychology*, 1925, Vol. 8, pp. 337-343.

curve of forgetting as a "variable" the number of whose forms approaches infinity as a limit. There are numerous factors contributing to this variability, for example: the degree of mastery in the initial learning, the character of material originally learned, the speed of initial learning,

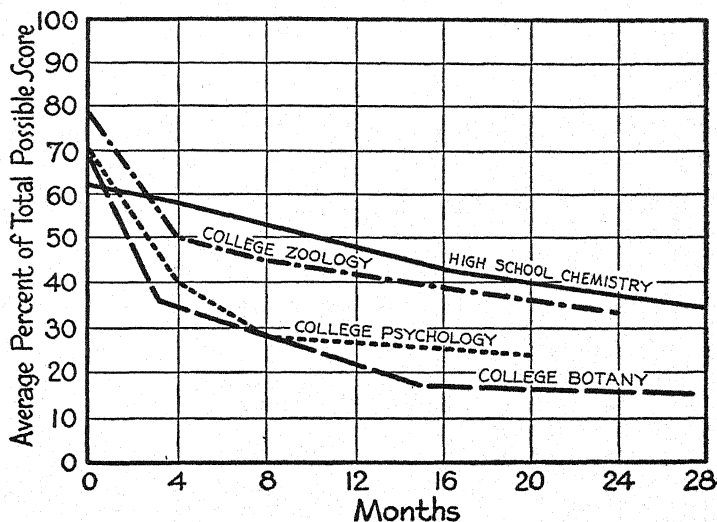


Fig. 17.—Retention of High-School Chemistry, College Botany, College Psychology, and College Zoology. (After Greene, Johnson, and Powers.)

the distribution of learning, the difference in individual subjects, the amount and character of activity following the learning, and the method by which retention is tested.

The curves of forgetting presented in Figure 17 are quite typical. The forgetting curve for chemistry does not show the early rapid decrease.¹⁶ This type of curve usually results from overlearning, systematic reviews, and careful application of principles learned. The other

¹⁶ Powers, S. R., "A Diagnostic Study of the Subject Matter of High School Chemistry," *Contributions to Education*, Columbia University, Teachers College, 1924, No. 149, pp. 49-54.

curves are curves of forgetting typical for most of the high-school materials.¹⁷ They are characterized by an early rapid decline followed by a more gradual decline. Some factors related to retention have already been discussed. Cuff presents some interesting and worthwhile conclusions based upon experimental studies concerning the effect of overlearning on retention. These are:

1. There is not an approximate proportionality between the number of readings of a series and the saving of work made possible thereby, as one reading saved out of three readings after an intermission of twenty-four hours.

2. The percentages saved may decrease as the repetitions increase after a series is learned. Table VII shows that more practice after a series is learned may do good, may be wasted or may be detrimental.

3. Girls show a slight superiority over boys in the smaller number of readings required for learning a series, in the lower percentage that the readings for relearning were of the readings for learning, and in the higher percentage that the readings saved were of the total readings. This superiority is so small, however, that it is practically negligible.

4. The correlations of the percentages that the readings saved were of the total readings show, by being low, that subjects who have high scores on one test often have low or medium scores on another test.

5. The brighter subjects profit less from the additional readings after a series is learned than do the duller ones.¹⁸

Importance of reviews. In those activities in which fundamental skills, attitudes, and habits are required, special drills should be conducted. The amount and nature of such drills will depend upon such factors as the complexity of the task, the maturity of the learner, the manner of presentation, and the interests and attitudes

¹⁷ Greene, S. B., "The Retention of Information Learned in College Courses," *Journal of Educational Research*, 1931, Vol. 24, pp. 262-273; Johnson, P. O., "The Permanence of Learning in Elementary Botany," *Journal of Educational Psychology*, 1930, Vol. 21, pp. 37-47.

¹⁸ Cuff, Noel B., "The Relation of Overlearning to Retention," *Contributions to Education*, George Peabody College, 1927, No. 43.

of the learner. Drill means the exact repetition of items, the purpose of which is to establish an automatic, invariable response to the item. Drill is especially important in the fundamental tool operations that are essential for further educational growth. It should not be used in the case of problem activities or relational and associative thinking. It is here that reviews and outlines can best be used.

The purpose of the review should be (1) to prevent the early rapid loss of knowledge, understandings, attitudes, and will; and (2) to aid in the integration and organization of knowledge, educational materials, and skills so that they will be more useful in the learner's life and thus further the development of his attitudes, character, and personality. One of the common mistakes in teaching is, after materials have been studied and the students have been given a test on them, to relegate them to the past. The fact that college students often find that they have become very deficient in certain activities acquired in high school is owing in a large degree to the lack of early drill on the materials learned. Any habits not used constantly will be likely to deteriorate to some degree. This deterioration, according to the curves of forgetting, is greatest during the interval immediately following the learning process. If this rapid deterioration in the retention of materials is to be averted, there must be systematic reviews during the several months following the learning activity.

School attendance and mental and educational development. In studying the effect of the extent of school attendance upon mental and educational ages, Katherine Denworth found that "of homogeneous groups studied the most variable group in length of school attendance is the least variable in mental and in educational ages, the

least variable group in attendance is the most variable group mentally and next to the most variable educationally. Differences in the amount of schooling of these pupils of a single age do not account for differences in their mental and educational development." She concludes: "The low correlations between length of school attendance and educational acquirements of these unselected pupils of the same age are not to a significant extent the result of variation in the time they have spent in school."¹⁹

This is a very interesting conclusion in the light of a demand on the part of some educators and laymen for a longer school term on the basis of its educational advantages. There are several explanations for this conclusion. In the first place, maturation must not be overlooked. A great deal of educational growth will be a result of maturation from out-of-school experiences if there are meanings and rich associations involved in the school and out-of-school life. Again, in the case of the shorter term, the teacher limits her work and sets the goal of attainment within a shorter term. In her effort to cover the fundamentals set forth in the curriculum, she probably drives a little harder because of the shortness of the time and includes fewer materials outside those laid down by the course of study than she would with a longer term.

This is not saying that the six-months school is to be preferred to the eight-months school, or even the eight-months to the nine. It is, indeed, quite likely that such elements as attitudes, character, and personality qualities are more to be desired than certain intellectual performances. Education must be conceived of in terms of the organization of personalities, and must be directed in har-

¹⁹ Denworth, Katherine, "The Effect of Length of School Attendance Upon Mental and Educational Ages," *Twenty-Seventh Yearbook of the National Society for the Study of Education*, Part II, 1928, p. 87. Quoted by permission of the Society.

mony with individual needs. The child that is inclined to be "bookish" will profit by missing school and going to some athletic performance, a picnic, or a hike to the countryside. The matters of school attendance and length of the school term must be studied in the light of the individual needs and individual out-of-school performances.

Achievement in the elementary school compared to achievement in the high school. The amount of prediction which can be made from the elementary grades to

TABLE LXII

CORRELATION OF ACHIEVEMENT IN FIRST-YEAR HIGH SCHOOL WITH GRADE-SCHOOL COMPOSITE SCORES AND INTELLIGENCE, READING, AND ARITHMETIC TEST SCORES. (After Ross.)

Factor	General Average	English	Latin	Mathe- matics
Grade School Composite.....	.63	.61	.58	.55
Terman Intelligence Test.....	.37	.46	.18	.42
Thorndike-McCall Reading Test...	.33	.33	.48	.31
Woody-McCall Arithmetic Test...	.40	.34	.44	.46

the high school depends on the trait or function being considered. For much of the work of the school we have no reliable measures, and, of course, no definite prediction can be made in such cases.

It is found for certain of the language abilities that achievement in the early grades is correlated to a fairly high degree with achievement in the high school. For others, there is practically no correlation. Here again, however, the reliability and objectivity of our measuring instruments must be considered.

In Table LXII, coefficients of correlation are given for certain measurements taken in the elementary school and achievement in the first year of high school.²⁰ An exam-

²⁰ Ross, C. C., "The Relation Between Grade School Record and High School Achievement," *Contributions to Education*, Columbia University, Teachers College, 1925, No. 166, p. 36.

ination of the table reveals that the "grade school composites" yield in every instance a higher score than any one of the three standardized tests. The three tests were given in April preceding the entrance of the pupils to high school. These correlations are so low that, if they are representative, it might safely be stated that no prediction can be made from elementary-school achievement

TABLE LXIII

CORRELATIONS BETWEEN CERTAIN TEST SCORES SECURED IN FOURTH AND NINTH GRADES (110 CASES)

<i>Hillegas Composition with Hillegas Composition</i> . . . . .	.32
<i>Terman Vocabulary with Terman Vocabulary</i> . . . . .	.78
<i>Terman Vocabulary with Hillegas Composition</i> . . . . .	.29
<i>Monroe Reading with Monroe Reading</i> . . . . .	.61
<i>Monroe Reading with Terman Vocabulary</i> . . . . .	.67
<i>Monroe Reading with Hillegas Composition</i> . . . . .	.12
<i>Monroe Reasoning Arithmetic with Monroe R. A.</i> . . . . .	.63
<i>Monroe Reasoning Arithmetic with Monroe Reading</i> . . . . .	.56
<i>Monroe Reasoning Arithmetic with Ill. Algebra</i> . . . . .	.52
<i>Ayres Spelling with Ayres Spelling</i> . . . . .	.73
<i>Ayres Spelling with Terman Vocabulary</i> . . . . .	.65
<i>Ayres Spelling with Hillegas Composition</i> . . . . .	.31
<i>Ayres Spelling with Monroe Reading</i> . . . . .	.47
<i>Starch Punctuation with Starch Punctuation</i> . . . . .	.14
<i>National Intelligence with National Intelligence</i> . . . . .	.81
<i>National Intelligence with Terman Vocabulary</i> . . . . .	.64
<i>National Intelligence with Hillegas Composition</i> . . . . .	.12
<i>National Intelligence with Monroe Reading</i> . . . . .	.59
<i>National Intelligence with Monroe Arithmetic</i> . . . . .	.47
<i>National Intelligence with Ayres Spelling</i> . . . . .	.53

to high-school achievement. However, so many elements enter into school grades that the latter are of little value as a basis for estimating either a child's true ability or his future achievement.

Records of the achievement of individual children in the Peabody Demonstration School have been kept for a number of years.²¹ In the study of the relation between

²¹ Garrison, S. C., unpublished materials, on file in Jesup Psychology Laboratory, George Peabody College.

achievement in the elementary grades and that in the junior high school, certain correlations have been computed. These are given in Table LXIII. An examination of the data presented in the table reveals the fact that there is a wide range in the degree of relationship which exists between the several sets of scores. Vocabulary, reading, spelling, arithmetic, and intelligence give fairly high self-correlations even when the testings are separated by a period of five years. On the other hand, there are several abilities which give results upon which no prediction can be made.

Thought Problems

1. What do you understand by the term *educational growth*? *Educational age*? *Achievement quotient*?
2. If data are available, study some individual growth curves. Of what use would these curves be to a high-school teacher?
3. What are some factors related to retention?
4. Present a graphical illustration of the relation between over-learning and retention.
5. What factors have prognostic value in relation to educational growth during the secondary-school period?
6. Discuss the contribution of the testing movement to our understanding of educational growth.

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CHAPTER XXI

Attitudes and Appreciations

Organized educational endeavor rests, in the end, on the fundamental principle that all ignorance is not voluntary, or, at least, that the majority of people are not obstinately adverse to knowledge. Education for democracy should be inspired by the belief that most men want to do right in public affairs, and that, if they do not do right, it is because they sometimes find it difficult to know and understand what is right. An enlightened democracy must be competent to meet the social, moral, and economic questions that it will surely face. All fundamental problems can be reduced to a form in which they can be more carefully and easily studied than is possible in the form in which they are met. The average man can arrive, with reasonable frequency, at a fairly correct opinion if he knows how to gather evidence and is able to judge its value.

Accurate thinking, thinking critical of itself as well as of the thoughts of other people, is what must be learned. Socrates said of this, "Knowledge does not consist in impressions of sense, but in reasoning about them; in that only, and not in mere impression, truth can be obtained." Attitudes wholesome and dynamic in nature become forces that will well-nigh assure behavior of a desirable type. Appreciations for the marvels of nature and the great accomplishments of man, along with an appreciation of the social relations of the complex

society that exists today, are important in offsetting various destructive forces that are likely to arise as a result of the artificiality of a changing civilization.

The development of attitudes. The term *attitude* has come into use as a phase of development of a more highly integrated nature than factual learning, development closely related to character growth. Thurstone defines an "attitude" as: "The sum total of man's inclinations and feelings, prejudice or bias, preconceived notions, ideas, fears, threats, and convictions about any specified topic. Thus a man's attitude about pacifism means here all that he feels and thinks about peace and war. It is admittedly a subjective and personal affair."¹

An attitude might be thought of as anticipatory behavior. It represents a general "set" or state relative to something. Attitudes always relate to situations around which we have constructed various habit patterns and built up various images and concepts. Some problems of special interest relative to attitudes will be considered in this and the next topic for study. The question of the definition, formation, and direction of attitudes will be given special consideration in this topic.

That physical and social contacts result in the establishment of conscious adjustments and reaction tendencies has been constantly observed. The child born and reared in a social world is constantly subject to social stimuli that are ever changing. "He therefore develops attitudes toward objects and persons, and through his attitudes brings himself to adjustment with his world. Social contacts are, hence, contacts in which attitudes arise."²

¹ Thurstone, L. L., "Attitudes Can Be Measured," *American Journal of Sociology*, 1928, Vol. 33, p. 531. Reprinted by permission of the University of Chicago Press.

² Krueger, E. T., and Reckless, W. W., *Social Psychology*, New York, Longmans, Green and Company, 1931, p. 269.

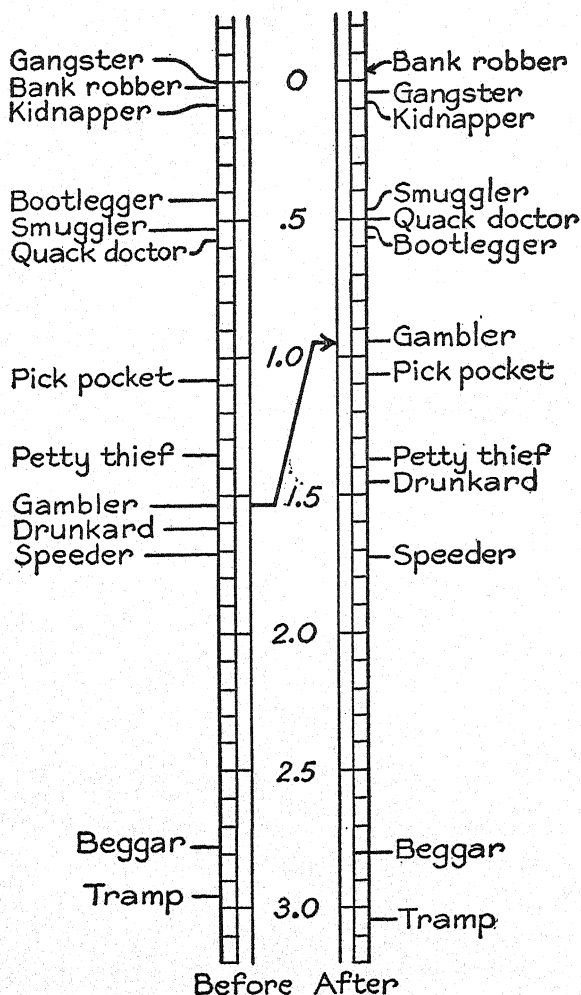


Fig. 18.—Seriousness of Crimes as Judged by 240 High-School Pupils Before and After Seeing the Film, *Street of Chance*. (After Ruth Peterson.)

The various studies that have been carried on recently with motion pictures as they affect children's attitudes indicate that this form of entertainment may be a potent

force in conditioning or reconditioning certain attitudes. These studies point out that changes brought about thus are not just temporary, but tend to persist. Figure 18 shows the change of attitude by 240 high-school pupils after seeing the film *Street of Chance*.³ On this scale, crimes were judged from most to least serious, 0 representing the crime most serious. Studies made from showings of other films relating to war, prejudice toward the Germans, attitude toward the negro, and so forth, revealed a significant change of attitude resulting from the seeing of the picture.

The extent to which attitudes change or are established in the schoolroom will depend upon the degree to which the pupil reacts to the subject matter as significant and meaningful materials, and thus generalizes from it to a more abstract principle. Subject matter taught as so much factual material will be remembered only as so much factual material by all students save a few. For factual materials to function in the establishment of desired habits, such materials must be carefully selected in harmony with the pupil's understanding and must be so presented as to challenge the individual's interest and mental alertness. By noting the significance of such materials and by using them in the solution and understanding of further problems, the student will tend to develop attitudes in which such materials are definitely integrated.

Importance of studying attitudes. The study of attitudes is important from two standpoints: first, because of the great role which they play in man's behavior, it is important for successful and peaceful living with other people to study them; and second, a knowledge of the

³ *Developing Attitudes in Children*, Proceedings of the Chicago Association for Child Study and Parent Education. Graph from "The Effect of Motion Pictures on Social Attitudes of High-School Children" by Peterson. Reprinted by permission of the University of Chicago Press.

process by which they are built up is important from the standpoint of social control.⁴ Both viewpoints are meaningful for educators. Rosander says, "We find teachers reorganizing their objectives and replanning their courses in the light of the attitudes which the subject matter is supposed to develop."⁵ A more specific example of the value of attitude measurement is illustrated by J. L. Hypes's use of the attitude scale. Hypes⁶ uses the scores of an attitude test given at the beginning of the term as the basis for his teaching in his sociology classes with remarkable results.

The importance of attitude study is ever being recognized more widely, and such study has expanded into practically all fields of human endeavor. A review of the investigations conducted in this field as presented in a number of the *Psychological Bulletin* each year will reveal the extent to which they are being studied. Rosander points out the uses to which attitude study is being put in the field of education when he says, "Knowledge is no longer the sole aim of education; the long neglect of the emotional side of student development is about over. Attitudes, appreciations, and ideals are taking their place alongside abilities and understandings as the significant learning products of school education."⁷

The measurement of attitudes. The measurement of attitudes, like the measurement of electricity, must be based on, not the thing itself, but its effects. As there are

⁴Lundberg, G. A., *Social Research*, New York, Longmans, Green and Company, 1929, p. 199.

⁵Rosander, A. C., "Can Attitudes be Measured?" *Phi Delta Kappan*, Vol. XIII, 1930, No. 3, pp. 75-79.

⁶Hypes, J. L., "The Social Distance Score Card as a Teaching Device," *Social Forces*, 1928, Vol. VII, pp. 234-237.

⁷Rosander, A. C., *op. cit.*, p. 75.

a great many effects or expressions of attitudes, so there are different avenues for studying this form of behavior. The two general types of approach would be (1) observation of a person's past and present overt, non-verbal behavior in a given situation, and (2) observation of a person's verbal behavior in the form of specific opinions.⁸ Of the latter type of approach (a) the oral interview and (b) the attitude questionnaires and rating tests are the most prevalent forms.

The *Pressey X-O Test* was devised to measure attitudes or reaction tendencies involving moral problems, possible topics of anxiety, and interest. The directions for the first test and the first five lines of it are here presented:⁹

Read through the twenty-five lists of words given just below and cross out EVERYTHING THAT YOU THINK IS WRONG—everything that you think a person is to be blamed for. You may cross out as many or as few words as you like; in some lists you may not wish to cross out any words. Just be sure that you cross out everything that you think is wrong.

1. begging, smoking, flirting, spitting, giggling.
2. fear, anger, suspicion, laziness, contempt.
3. dullness, weakness, ignorance, meekness, stinginess.
4. fussiness, recklessness, silliness, nagging, fibbing.
5. extravagance, sportiness, boasting, deformity, talking back.

The other tests are similar in construction to the illustration presented. With increase in age, up to a certain point, at least, there is a marked decrease in the number of things reported as causes of worry. There is quite a change in the character of the worries; that is, the younger element worries about fears of lightning and fire, but with

⁸ Lundberg, G. A., *op. cit.*, p. 207.

⁹ Pressey, S. L., *et al.*, *Research Adventures in University Teaching*, Bloomington, Ill., Public School Publishing Company, 1927.

the onset of adolescence worries relative to clothes develop. Boys, as they advance in age, show a rapidly increasing liberal attitude toward things previously considered wrong; while girls, especially during the high-school period, show very little change. This contrast is quite probably due to the greater influence that home has over the girl, for with entrance into college there is a greater change in the attitudes of girls toward things previously considered wrong. Such findings lend added support to the contention that attitudes are essentially a product of social influences.

The studies of Pressey deal with attitudes that have developed over a long period of time. Recently, much scientific work has been done in the measurement of specific attitudes. Many of these studies have thrown light upon specific factors related to the development of attitudes. The following summary of the different types of attitude questionnaires and rating scales is given by Rosander:¹⁰ (1) those using agreement and disagreement, (2) those employing intensity of agreement and disagreement, (3) those in which order of preference is determined, (4) those in which the scale values are assumed, and (5) those using computed scale values. Perhaps the most extensive work on this problem is represented by the series of scales recently developed by Thurstone.¹¹ Each scale consists of a group of statements varying from one extreme to another. The person taking the test checks the statements which indicate his attitude, and his attitude towards the subject or problem at hand is determined by a score derived from his choices.

¹⁰ Rosander, A. C., *op. cit.*, p. 77.

¹¹ Chave, E. J., and Thurstone, L. L., *The Measurement of Social Attitudes*, Chicago, University of Chicago Press, 1931.

Scientific attitudes. It is commonly assumed that a scientific attitude is developed through the acquisition of scientific facts. Many claims for the value of science have no more foundation than some of the disciplinary claims made a half-century ago with reference to certain subjects. An analysis of the claims made for science reveals a disciplinary concept quite similar to that, now discredited to a large degree, which was the basis of the curriculum of the Latin grammar school.

That scientific attitudes cannot exist without some factual knowledge is doubtless quite true; yet there is no consistent relation between the amount of scientific knowledge and the scientific attitudes existing. This is true not only in the case of science, but in other realms of knowledge as well. Knowledge of science may be a result of superficial reading or of rote memory performed without special regard for the study of problems or the application of facts. Other factors that influence the development of scientific attitudes are: (1) *A cultural background.* A social and educational background filled with prejudice and superstition decreases the extent to which scientific facts are applied. (2) *The breadth of educational experience.* In the person with a wider range of educational experience, who has read extensively, and who has carried on other activities of an educational nature, there will be a greater development of scientific attitudes. (3) *Superior intelligence.* In harmony with the findings relative to the transfer of training, there is greater application of scientific facts with increase of the ability to carry on mental processes. Superior students are able to see more readily the possible application of laws and principles to other situations.

It follows from this line of reasoning, "No person is

able to apply all the facts he knows. However, when the facts are known, the fewest errors are made in the situations in which a person has had the most experience. It follows, then, that the methods employed in the teaching of science should present facts and principles in relation to as many of the important situations in daily life as possible."¹²

The emphasis on factual materials in science is well illustrated in an investigation, conducted by Garner,¹³ of 33 examination papers in chemistry containing a total of 382 questions. Of these, 23.8 per cent dealt with pure facts, such as definitions, laws, etc., 18.32 per cent dealt with the use of symbols, and 7.5 per cent dealt with chemical problems. Most examinations, in science and mathematics especially, have tended to put a premium on facts—in many cases, facts unrelated. Such an emphasis fails to provide for the fuller development of understanding, applications, appreciations, and attitudes.

There is experimental evidence that extensive reading definitely favors the development of scientific attitudes.¹⁴ If such attitudes are to be established through the work in science, it is quite essential that the students be given a wide range of collateral reading materials of a less technical nature than the text in addition to the required intensive work with the text. If the development of scientific attitudes is one of the major goals of the science work, and if both an extensive and an intensive reading

¹² Moore, Evelyn B., "A Study of Scientific Attitudes as Related to Factual Knowledge," *School Review*, 1930, Vol. 38, p. 386.

¹³ Garner, E., "A Study of Chemistry Examination Questions Given by Various States and Cities in the Middle West and East," *School Science and Mathematics*, 1927, Vol. 27, pp. 140-143.

¹⁴ Curtis, Francis D., "Some Values Derived from Extensive Reading of General Science," *Contributions to Education*, Columbia University, Teachers College, 1924, No. 163.

program are set forth, these attitudes will be likely to be established.

The investigation by Wrightstone¹⁵ was designed to study the degree of correlation that existed between the pupil's total score on a test for natural science beliefs and the following intellectual and social factors: (a) verbal intelligence; (b) achievement on a standardized test of knowledges in general science; and (c) socio-economic status. Data were secured by means of objective tests administered to pupils in Grades VII to XII, inclusive, in secondary schools of Summit, New Jersey, and Bronxville and Rochester, New York.

From this study Wrightstone found: (1) a positive, though low, correlation between scores on natural science beliefs and intelligence; (2) a marked positive correlation between knowledges of natural science and more desirable natural science beliefs; (3) a negligible correlation between natural science beliefs and socio-economic status; and (4) a statistically significant difference in the average scores for boys and girls. The girls, as a group, are less discriminating in their science beliefs.

Group consciousness. If we are to develop group consciousness in the full sense of the word, varied types of activities must be carried on and integrated within the school. In the first place, group consciousness in relation to various groups is present, and if this group consciousness is well organized and well integrated in the child's educational experiences, there need not be any conflicts. A pupil may possess at one time an intense loyalty for the group comprising his class in high school, a deep loyalty

¹⁵ Wrightstone, J. W., "Correlation of Natural Science Beliefs and Attitudes with Social Intellectual Factors," *Journal of Science Education*, 1934, Vol. 18, pp. 10-12.

for his school, a great loyalty for his State, and an abiding loyalty for his nation. In addition to these various loyalties, he may be willing to sacrifice himself for the welfare of the world. No one who is acquainted with the life of Robert E. Lee doubts Lee's loyalty to his country; it was a deeper feeling for his State and neighboring States that led him into battle against the country to which he had formerly sworn loyalty and proved his strong allegiance.

The development of a strong sense of loyalty to a team in school is quite desirable providing it doesn't interfere with the development of a broader and more inclusive loyalty. Team activities in high school should contribute toward a more concrete realization of the meaning and significance of group membership. This understanding may be so generalized that it will be of especial value in arriving at the importance and necessity of group co-operation in larger and more far-reaching activities. It may thus be made the basis for a group consciousness concept.

If history and civics are taught in such a way that high-school pupils realize that the development of civilization has been a result of co-operation and the upholding of ideals, an attitude of unity and a large loyalty will be established. The pupils can be taught science in such a manner that they will see it as a part of our contemporary life which has been developed for use in the production of a greater and better civilization and for the welfare of humanity. If the pupil is taught materials as they relate to contemporary life and can come to see the livingness of things, he will have a fresh approach that will lead him to a better understanding of man's place in the world and also to a better comprehension of his own place in the group.

Change of attitudes. It has already been pointed out that attitudes are "determiners of behavior," and that they develop out of social experiences. In the various attempts to measure attitudes, investigators have also attempted to determine the change in attitudes resulting from certain biological and environmental factors. The study by Moore and Garrison ¹⁶ indicated that intelligence, educational environment, and years in college were influential factors in the development of more liberal attitudes. A rather recent study by Clem and Smith in which a questionnaire involving fifteen items was administered to 1,172 secondary-school pupils is of interest in this connection. This study was designed to determine the relative attitudes of high-school pupils of different grade levels toward some rather definite moral situations. Some conclusions which they reached are:

1. The attitude of pupils toward such personal habits as swearing, drinking, gambling, and playing cards on Sunday becomes more tolerant in succeeding grades of the six-year secondary school. In general, the reverse is true for cheating, lying, conceit, vulgarity, selfishness, gossip, and extravagance.

2. In terms of "badness," stealing is uniformly considered by all grades the worst of all items studied, and dancing the least "bad."

3. It is evident throughout the study that lower grade pupils are more inclined to make choices on the basis of indoctrination than are upper grade pupils. Upper grade pupils exhibit better social discrimination and judgment, and less ingrained respect for law.

4. In terms of law observance, upper grade pupils are more inclined to substitute personal judgment for blind obedience: the spirit for the letter of the law.¹⁷

¹⁶ Moore, Gwyn, and Garrison, K. C., "A Comparative Study of Social and Political Attitudes of College Students," *Journal of Abnormal and Social Psychology*, 1932, Vol. 27, pp. 195-208.

¹⁷ Clem, O. M., and Smith, Marcus, "Grade Differences in Attitudinal Reactions of Six-Year Secondary School Pupils," *Journal of Educational Psychology*, 1934, Vol. 25, p. 308.

The child's attitudes are more or less transitory and are constantly being modified by the various educational agencies with which he comes into contact. These attitudes are a result of learning experiences and, although intangible in character, develop in harmony with the various teachings set forth. The schools have often failed in the teaching of attitudes, owing to one or a combination of several factors, which are: (1) the teacher's failure to identify the attitude, owing to its intangible nature; (2) the lack of a definite goal in the teaching process; (3) undue interest on the part of the pupil in factual materials and, thus, a failure to make the desired associations; (4) the teacher's failure to consider the ability and nature of her pupils; and (5) the supposition of a widespread transfer based upon narrow or factual learning.

The development of appreciation. During adolescence, the appreciative processes undergo further and further development in harmony with the general growth and understanding of the child. In a recent study at North Carolina State College,¹⁸ it was revealed that appreciation of literature by sixth-grade pupils was closely related to vocabulary ability. Since literature appreciation correlates rather closely with the ability to understand language and is always limited by it, one would expect a growth in general appreciative ability with the growth of the intellectual ability—which would enable the child to understand better such types of materials as humor, literary principles, and verbal abstractions. The appreciative power develops in harmony with the development of intellect and increases more rapidly than does the power

¹⁸ Garrison, K. C., and Thomas, Mabel, "A Study of Some Literature Appreciation Abilities as They Relate to Certain Vocabulary Abilities," *Journal of Educational Research*, 1930, Vol. 21, pp. 396-399.

to produce. Thus, we find an early loss in various productive abilities, as is the case in drawing, music, poetry, and so forth. Both physical and emotional growth are so rapid that the development of skill and expressive power is not able to keep pace with them. The high-school pupil becomes conscious of his inability to express his feeling of life, and it is in this connection that the guidance and development of the affective elements of life become very important.

Appreciation and science. The proper selection and study of science materials will produce a store of tastes and appreciations which is an inexhaustible source of pleasure and understanding. For instance, the individual with a clear understanding of physics will perceive a new beauty in the material structures around him. He will see in the great mass of steel a marvelous display of strength and of the laws of physical energy; he will see in the rushing waterfall an ever-present store of energy ready for use. He will see on the hillsides fertile fields which can be better irrigated. The biologist can behold in the plants and flowers the beauty and marvels of an all-powerful natural law and the disclosing of an inner perfection of it. He can see, by the dissection of some organism, the glorification and manifestation of a greater perfection of nature. To the common person, the material world holds very little in the way of beauty; but to the student of science, it is the revelation of the wonders of nature.

Education deals with more than the gaining of knowledge and ideas through the various senses and with more than logical thinking. It is not limited to the formation of habits or the acquirement of facts. It is also a development of an appreciation of beauty, of a greater respect for nature's laws, of a concept of harmony in life, and of a

dislike of the undesirable, the ill-fitting, and the untidy. It is a process of rising to high standards of living through a greater æsthetic development. In this great process of the appreciation of nature, science should take one of the leading roles.

Growth of literature appreciation. Language as a medium of literature presents two aspects: one that might be called a *latent emotional content* and a particular *morphological conformation*. The emotional content of language is very large. As we have previously seen, every word is surrounded by an emotional fringe, unless its meaning has so completely faded that it has become purely morphological in function. It is this emotional aspect of language that causes us to like or to dislike certain words or expressions. Not that a particular word or expression conveys thought more accurately or more efficiently than another; it is rather that one pleases while the other does not. This capacity in words to arouse pleasure or displeasure through their emotional content is what gives them æsthetic value and forms the groundwork of literature. The selection of words whose emotional associations harmonize with his own sentiments, on the one side, and arouse corresponding sentiments in his hearers or readers, on the other, is the primary problem of every literary artist.

Language becomes, so to speak, a core around which are crystallized the sentiments and the thoughts of its users. Its words are not only the medium for the expression of the thought process; they are also the objects of certain associations and attitudes which in turn stimulate the process of thought itself.

Carroll¹⁹ made a study of the relation between intelli-

¹⁹ Carroll, H. A., "Appreciation of Literature and Abstract Intelligence," *The Journal of Educational Psychology*, 1934, Vol. 25, pp. 54-57.

gence and the appreciation of literature. In this study he gave the *Carroll Prose Appreciation Test* to 600 junior-high-school and 270 senior-high-school pupils. The correlations that he found for the six grades studied (VII to XII, inclusive) ranged from $.27 \pm .04$ to $.48 \pm .05$, which signify a definite positive relation almost as high as is ordinarily found between intelligence and achievement in the academic high-school subjects. A further comparison of the literature appreciation scores of those pupils with an I. Q. below 100 reveals a positive relation. This comparison is presented in Table LXIV. It should be pointed out, however, that the relationship here existing is far from perfect and that, while literature appreciation is related to and dependent in part upon abstract intelligence, there are other factors that are prominent in effecting such a causal relationship.

TABLE LXIV

COMPARISON OF INTELLECTUALLY SUPERIOR AND INTELLECTUALLY INFERIOR CHILDREN IN APPRECIATION OF LITERATURE. (After Carroll.)

	Junior High School		Senior High School	
	Below 100 I. Q.	I. Q. of 120 and Over	Below 100 I. Q.	I. Q. of 120 and Over
Number.....	59	52	58	57
Mean I. Q.....	94.74	130.29	96.07	128.60
Mean literature appreciation score.....	18.93	28.85	30.57	44.71

The dynamics of attitudes and appreciations. The complexity of man's social environment has already been considered. The social environment is peculiarly baffling to the maturing child because it requires that he delay his natural drives and remain in a state of prolonged infancy after he has matured to the point of becoming a member of the adult group. This, of course, presents problems in mating and sex guidance. The general habit revision that takes place at this age presents a trying situation in the

child's life. Understanding and appreciative phases of life come into being as partial determining factors in the conscious choices of further maneuvers in living. Attitudes and appreciations thus developed come to be directing forces in relation to man's activities. They may be considered determiners and directors for behavior outlets. These are especially in the making during adolescence, since the pupil has then reached a stage of clearer and broader understanding. They give an expansion to the emotional life and furnish further fields for the manifestation of appreciative and affective states.

By the time this period of life is reached, an ideal of beauty, worth, and affective value is becoming firmly grounded into the life of the individual. This ideal becomes detached from arbitrary appeals and commands and comes to be of an intrinsic nature, appearing to arise within the self as a part of the general habit pattern of the self.

Thought Problems

1. List in order the factors that you consider most important for literature appreciation. Would you present this list, and in the same order, for art appreciation?
2. Illustrate the dynamic nature of attitudes and appreciations.
3. What are some of the characteristics of the appreciative processes present during the secondary-school period?
4. Put a "T" before those statements that are true and an "F" before those that are false.
 - a. Citizenship training should be limited primarily to the senior-high-school level.
 - b. There is no consistent relation between the amount of scientific knowledge and the scientific attitudes existing.
 - c. Scientific facts and principles should be presented in relation to problems that are meaningful and significant if the scientific attitude is to be developed.

- d. Intensive reading is the most desirable method of developing scientific attitudes.
- e. Most examinations in science deal with general principles and the applications of facts.
- f. Scientific attitudes are inversely related to intelligence among college students.
- g. Factual materials *as such* are very valuable for developing desirable attitudes.
- h. The term *attitude* refers to behavior of a more highly integrated nature than factual learning.
- i. Studies of changes of attitudes resulting from motion pictures show that such changes are temporary in nature.
- j. Attitudes should be thought of as overt behavior expressions.
- k. Attitudes of co-operation can best be developed by the study of the necessity for co-operation.

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CHAPTER XXII

Problem of Guidance

The meaning of "guidance." Teaching has already been referred to as the process by means of which the individual is guided and aided in modifying his original nature so as to better adjust to an ever-changing social and physical world. If the schools accept their responsibility in the development of the individual as a growing personality that is to live in a rapidly changing social world, their first consideration should be the nature of the child. Guidance should begin with a study of the child, and the subject matter should become a means to aid in the development of a wholesome, well-balanced personality. In a sense, then, the work of the teacher is primarily concerned with the problem of guidance. The success of the teacher is to be judged by the extent to which he is successful in the guidance and direction of the pupil in learning activities.

According to this broad conception of the term *guidance*, every act of the teacher, her procedure in organizing materials, each of her techniques of motivation, every item of instruction, is to be regarded as a phase of guidance. The term as usually used has a much more limited meaning. It has come to be thought of in relation to the teacher's direct and personal contacts with the pupils. There are two extreme views of guidance, each of which fails to recognize the worthwhile elements in the other. The first

concept is that guidance is concerned with looking mysteriously or magic-like into the face of the individual, asking a few questions, accumulating some test data, and on the basis of this arriving at an exact decision as to some niche of human affairs where the individual should fit. The other view would have the individual develop according to his natural inclinations, follow his own interests, and thus move forward without interference. He would merely be motivated to develop along the line of his interests without regard to the nature of such interests or the relation between such interests and the possibility of their fulfillment. We would neither try to direct the individual in a specific pathway without a possibility of deviation, nor attempt to follow a naturalistic philosophy to the extent of encouraging interests without a consideration of other factors that are highly important.

Types of guidance. Too often guidance is thought of as "educational guidance" or "vocational guidance" in isolation from other elements or phases of guidance. According to the concept of the individual as it has been presented throughout our study of him in relation to the materials and problems of secondary education, one cannot think of growth or guidance in one direction without a consideration of it in other directions. The development of the pupil as an integrated whole should be the point of view with which we approach the different types of guidance.

In the case of educational guidance, the chief concern is to direct the individual into those educational materials and procedures that are in harmony with the varied traits that he possesses and that will further aid him in making the best adjustments in life. Such a direction specifically relates to his occupational possibilities and will relate

further to his moral and temperamental self. A careful consideration of vocational guidance will bring one into direct contact with problems involving the educational, moral, emotional, and temperamental nature of the child. In other types of guidance—in morals, temperament, health, civic responsibility, recreation, safety, thrift, cleanliness, and so forth—divisions are drawn only because the specific type is the focusing point and not because the other types are omitted. The guidance given may be based upon the emphasis of the particular occasion, but any program of guidance will have in mind the objectives related to all the varied types of guidance.

The need of guidance in secondary schools. Guidance along many broad lines is a service that has become very essential in the effective school program. It is especially important at this stage of development because of the following considerations: (1) the fact that the individuals are now in a plastic, formative period of life; (2) the wide range of individual differences in our secondary schools; (3) the changes in the social and economic order to which the secondary-school pupil must make adjustments; (4) the greater occupational differentiation now present in our economic life; and (5) the development of many problems peculiar to the adolescent period which demand careful consideration.

a. *The plasticity of the adolescent.* Adolescent boys and girls are still in a formative stage of life. Although during the earlier years of childhood many elementary habits that are to become the foundation for the development of further habits have been formed, the final outcome of such a development will also depend upon the educational processes at work during the secondary-school period. High-school boys and girls are in a state of de-

velopment, with their final destiny dependent upon such factors as (a) their natural habits and interests, (b) their previous habits, and (c) the present forces that are guiding and directing them. The fact that most social and moral habits are still in a formative stage should give encouragement to those confronted with the problems of secondary education.

b. *The wide range of individual differences in our secondary schools.* The fact that there are enrolling in our schools individuals with all degrees of abilities and various interests increases the need of guidance. The great range of differences existing in our secondary schools was pointed out in Chapter V. These varying abilities, interests, and capacities present many problems each of which is somewhat unique. No pattern of advice will solve these problems, but a careful analysis of the nature of the pupil will aid one in rendering more effective and more efficient counsel. With all the progress that has been made in the adaptation of instruction to individual interests, needs, and abilities, this remains the outstanding problem of the secondary schools. Pupil development—not subject matter for college entrance requirements, marks, credits, or units—must increasingly be made the prime motive in secondary instruction.

The type of population now entering the secondary schools demands instruction vastly different from the college-preparatory type. Since 1890, the enrollment in our high schools has almost doubled. However, almost 50 per cent of the total secondary-school population group is still not in school. With further social development there will be a continuous increase until practically all youth will be enrolled to at least the age of eighteen. From the standpoint of the safety of the state itself, it is

imperative that this great segment of youth which formerly found places in industry be provided through the secondary schools with activities which are challenging and satisfying. These young people cannot be left idle. An academic curriculum will not meet their needs. The problem of meeting the individual needs of this vast body of youth is one of the major challenges to secondary education in the next decade.¹

c. *The social and economic transition.* That we are in a socio-economic transition state few will deny. The fact is, our civilization has rapidly changed from one based upon isolation and individualism to one of social contacts and collectivism. Until less than a century ago, practically all of the work was done by the hand with the most simple types of tools. The main source of energy was the muscular strength of man. With the development of the physical sciences, new forces have been released, better products have been developed, and human energy has been conserved. Famine, the ancient barrier and dread of the developing civilization, has been practically banished; but in its stead has arisen the problem of distribution of work and income.² We are, therefore, living in a period of transition, a period that will require further social planning and a careful guidance of the growing boys and girls to the end that they may be able to take their place in the emerging social order. Human values and human understanding are becoming more important elements in our civilization. President Roosevelt stated in his inaugural address of March 4, 1932: "Happiness lies not in the mere possession of money; it lies in

¹"Secondary Schools of Tomorrow," *Journal of the National Education Association*, 1934, Vol. 23, p. 137.

²Reynolds, C. N., "Social Conditions and Trends," *Occupations*, 1934, Vol. 12, No. 7, pp. 15-22.

the joy of achievements, in the thrill of creative work." Such an ideal is becoming the dominating element in our new educational philosophy.

These factors have presented a real demand for more attention to a careful direction of these adolescent boys and girls. The guidance of junior- and senior-high-school boys and girls has arisen as an instructional force in developing desirable citizens. The aims of guidance are stated by Kefauver as follows:

- (1) Guidance aims to give students an understanding of the social, recreational, health and vocational activities in which they will continue to participate after leaving school, and the need of education preparatory for such participation.
- (2) It aims to help students to discover interests and to form accurate judgments relative to the extent of their abilities in different types of activities.
- (3) It aims to acquaint students with the schools, courses and other educational provisions which best prepare for such activities.
- (4) It aims to help students select the activities in life in which they will participate and in which there is a large promise of success and happiness for them.
- (5) It aims to help students in planning an educational program which will best prepare them for their chosen activities, giving appropriate recognition to the need of education for the social, recreational, health and vocational activities.
- (6) It aims to distribute persons to the activities in society so that social needs may be best served. Improvements of the occupational distribution of workers should cause human talents to be more completely used and wealth to be more equitably distributed.³

Counseling the individual pupil. Pupils find themselves constantly in need of advice, but too often do not know where to turn for it. Students desire advice on problems pertaining to mental hygiene, physical health, moral problems, educational difficulties, occupational in-

³ Kefauver, G. N., "The Guidance Program and the Distributive Function of Secondary Education," *School and Society*, 1933, Vol. 37, p. 766.

terests, social problems, and every other phase of their life's activities. The teacher to whom a student feels free to go for counsel can be and usually is a great force in the development and molding of character. Teachers can encourage pupils to seek their advice concerning problems with which they are faced; but if there is to be a very great response on the part of the pupils, there are a few principles that must be rather definitely adhered to.

In the first place, it is recognized that pupils have problems and are eager to receive help with their problems, that is, provided this help is forthcoming in a spirit of honesty and understanding. The advisor's work can be effective only when he has the full confidence of the pupil; and once this confidence is broken, the effect of the counsel is considerably lowered. Some essential principles, therefore, are:

1. Keep the confidence of the pupils. The work of the counselor will be most effective when the pupil realizes the sincerity of the counselor.

2. The pupil wants honest and frank advice, not preachment.

3. Counsel will be more effective when cases are pointed out and when it is accompanied by precept and example.

4. Counsel will be more effective when it occurs as a result of the initiative of the pupil.

5. The counselor should display an attitude of sympathy and understanding. The child goes to a counselor for advice—not criticism.

Individual counseling of a private-interview nature requires techniques, skills, and a knowledge of the pupil's personality make-up. Owing to the last-named factor, the follow-up interview is likely to be the most effective.

The counselor is thus given the opportunity to study the individual's problems in the light of his personality and social background. The pupil, furthermore, is given the opportunity to present a plan or some ideas that are likely to be of value in aiding him to solve the problem with which he is faced. After all, it is the pupil who is the center element in a counseling situation, and if his problem is to be solved with complete satisfaction, he must have a part in the solution of it. The counselor is the one to whom he can reveal his troubles and thus find release; the counselor may suggest and thus through indirect guidance aid the student in solving his problem in a manner that will lead him to a more balanced status.

Methods in educational guidance. Various phases of educational guidance have been dealt with in the preceding discussions; therefore, the presentation here will merely review briefly some of these items and add a few other items significant to this problem.

The boy or girl entering high school comes into contact with new types of subject matter and is often in need of guidance. The pupil who is transferred to a new school environment is likely to need at least a minimum of guidance. The student who is maladjusted educationally, morally, or in health will in all probability need guidance. The child who is well adjusted but anxious to succeed in some later vocational activities will be likely to seek guidance. In answer to the general question: Who should receive educational guidance?, we may reply, Every school pupil.

The fact that individuals vary to a large degree in mental ability indicates a need for the adapting of our program to harmonize with individual needs. The fact that maladjustments are prevalent in the school tasks shows that this

problem is not being adequately cared for. Chapter XIX discussed the uses of measurements in relation to this problem. There the methods of providing for individual differences and the uses of tests in studying pupils were described. The problem of guidance is directly related to the testing movement and no doubt developed in part as a result of it. It is directly related to the modern trend of our civilization and is becoming all the more important with the further changes in the structure of our present-day civilization.

Tests and guidance. Data secured from mental, educational, and nonintellectual tests are very essential for a more efficient guidance program. These tests have come to be recognized as an essential element in guidance. In an investigation by Cunliffe,⁴ 52.1 per cent of the secondary schools of New Jersey studied considered the test program as a guidance activity. In those school systems where guidance bureaus have been established, the administering of the testing program for purposes of guidance is regarded as a specialized function of the bureau.

The rapid development of tests of various types, the frequent indiscriminate use of such tests, and the fallacious claims made by some individuals who have had only a meager training in the field of testing have caused a large number of educators to raise certain questions relative to the reliability and validity of tests. The proposition that sound tests do exist and furnish valuable evidence for guidance not otherwise obtainable, but that they must be used with discrimination and meticulous scientific probity, is probably the most reasonable theory to hold.⁵ The right type of test used properly may be-

⁴Cunliffe, Rex B., "Guidance Practice in New Jersey," *Studies in Education*, Rutgers University, School of Education, No. 2, p. 6.

⁵Crawford, A. B., "What About All These Tests?" *Occupations*, 1934, Vol. 12, pp. 13-18.

come a very effective instrument for educational and vocational guidance; but such instruments in the hands of those who do not recognize their values and limitations may actually prove harmful.

The use of an interest inventory. The inventory technique as a means of studying the personality make-up has grown in general usage within recent years. According to this procedure, the pupils' records contain in a more or less objective form information concerning personality traits, interests, and activities. Such a record of a large number of students can be obtained in a short period of time by the use of a group procedure. Data obtained from such an inventory on an individual pupil may be used to a very good advantage as a preparation on the part of a counselor for an interview with a particular pupil. Such data are also of special value in case studies, in vocational guidance, and in aiding the student in problem situations.

An interest inventory that has been used with satisfactory results at the Lincoln School of Teachers College, Columbia University, is presented in the Appendix. This is used in obtaining information from high-school pupils for personnel work.⁶ Along with the inventory, which consists of a record of the information desired, may be used a check-list which contains an extensive list of headings under each category. This is designed as an aid to the pupils in recalling and organizing their experiences. It is to be noted that this check-list may be omitted and the students required to present their preferences from memory.

Such an inventory can be used in either group or individual examinations. In order to assure that the re-

⁶ Hildreth, Gertrude, "An Interest Inventory for High School Personnel Work," *Journal of Educational Research*, 1933, Vol. 27, pp. 11-19.

sults are fairly accurate, the one administering the test should develop an attitude of co-operation on the part of the pupils. They should be led to realize that the test is designed to aid them in any problems that they may have, and is not designed as a means of "getting something" on them. The questionnaire should, therefore, be administered by someone with whom the students are in satisfactory report. In the case of doubt as to the accuracy of the results for a particular pupil, the scores of the inventory should be checked against the results from standardized tests, if possible.

Hildreth lists the many advantages to be obtained from such an inventory as follows:

More pertinent advice can be given concerning the selection of courses, vocational guidance, choice of college, the arrangement of sports, and social and activity programs. The data are invaluable in talks with parents, in making individual assignments, in classifying pupils, in coöperating with health services, in arranging the pupil's study program, and in case study of problem pupils.⁷

Aptitude testing. Individual differences in most aptitudes will tend to distribute themselves according to the normal probability curve. Except for a few unusual types of individuals, every person possesses some potential aptitude for the performance of every possible vocation. Aptitude tests have been developed to aid in making a more accurate estimate of these latent potentialities. It has furthermore been found that most aptitudes are rather complex, consisting of an integrated pattern of traits. It is for this reason that tests consisting of different types of subject matter have been developed for aptitude testing. Such a group of tests is referred to as a

⁷ *Ibid.*, p. 18.

battery of tests. Aptitude tests are at the present time in the making, some having already been developed in the industrial arts, music, mechanical ability, drawing, science, and certain other fields of activity. The results from the investigations with the battery of tests designed to test various aptitudes have revealed in most cases that a great deal of value could not yet be attached to them. They do, however, offer a great deal of encouragement and promise for further developments of a constructive, worthwhile nature.

The psychological examination. A review of the discussion of measurement presented in Chapter XIX will give a fuller picture of the development of the measurement movement and the importance of mental and educational tests in relation to our present-day educational problems. The problem of character and personality measurements will be presented in Chapters XXIII and XXIV. A study of the varied techniques used in human measurement will show the various approaches that can be made in an analysis of the individual. The study by Earle, referred to as the "London Experiment," conducted by the National Institute of Industrial Psychology of Great Britain, has furnished further evidence of the value of the psychological examination.⁸

In this experiment, 1,200 elementary-school children of London were used as subjects. An experimental group was given a rather complete psychological examination at the age of 14, while in a control group the only data present were the school marks and teachers' reports. A very definite association was found between the psychological make-up as revealed by the tests and vocational success

⁸ Earle, F. M., *et al.*, *Methods of Choosing a Career*, London, George G. Harrap and Company, Ltd., 1931.

as revealed by a follow-up study made several years later. This relationship was much closer for the experimental group than for the control group, showing that the prediction made on the basis of the psychological examination was the more accurate.

Concerning the importance of the teacher with desirable attitudes, interests, and insight relative to the high-school pupils, Earle presents the following thought:

Needless to say, it is to be hoped that everyone who attempts vocational advising will be thus qualified. It is not necessary to have a detailed knowledge of statistical techniques and the elaborate procedures of the research worker. Nor is it necessary to procure highly elaborate or expensive apparatus and equipment. Much valuable work can be done in a quiet and modest way by an intelligent and systematic use of those sources of information which are very often neglected because they are so familiar, viz., the day-to-day activities of the individual. Properly recorded and interpreted, and supplemented by observations obtained in situations specially devised to throw light upon particular aspects, the peculiarly personal activities of the individual form the best and safest foundation for offering advice.⁹

Arthur J. Jones¹⁰ says, “. . . *to guide* means to indicate, to point out, to show the way. It means more than to assist.” Because the word *vocational* has been attached to it, many insist upon the idea that “guidance” has an underlying utilitarian purpose, whereas the chief concern is that of education or acquaintance. That guidance must be concerned with a consideration of every phase of a boy or girl is a notion in line with the science and philosophy of the preceding discussion. Vocational guidance, educational guidance, health guidance, moral

⁹ Earle, F. M., “The Psychological Examination: Its Place in Vocational Guidance,” *Occupations*, 1934, Vol. 12, No. 8, p. 74.

¹⁰ Jones, A. J., *Principles of Guidance*, New York, McGraw-Hill Book Company, Inc., 1930.

guidance, and other forms of guidance must in each case include every other form of guidance. When we refer to vocational guidance, we should consider it in relation to all other factors present in the pupil's life activities.

A study of the aims of guidance as presented by Kefauver will show the significance of considering guidance with all its implications when dealing with the educational process. True guidance might be thought of as about synonymous with good instruction. Guidance thus becomes the function of every teacher. Guidance is not analytic in that it considers one element to the exclusion of all others. Its purpose is not that of developing one phase of an individual's personality or life habits. Its aim as presented by Kefauver shows this enlarged and unitary concept.

Thought Problems

1. Contrast the problems of primitive man and those of man today in so far as guidance is concerned.
2. What does guidance mean to you? What are some of the philosophies that determine the nature of guidance?
3. How would you set up an experiment to evaluate the guidance program?
4. What are some of the techniques of guidance? Which of these do you think has the most to offer us? Why?
5. In what sense is it true that "all good teaching involves to a large degree the problem of guidance"?
6. Give the functions of educational and vocational guidance. Which should be stressed in the junior high school? Why?

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CHAPTER XXIII

Psychology of Character

Educational growth has usually been interpreted in terms of the ability to perform schoolroom tasks. It is, however, usually recognized that a conception of education that prepares for worthy citizenship and adjustment in our present-day civilization must have a much broader aim. It is the province of this chapter to present in a brief form some of the more important psychological principles relating to the growth of character. The activities in the schoolroom and on the playground, as well as other activities of the school program, are coming to be considered more in terms of changes in ways of behaving and of the establishment of desirable motives in the lives of the growing boys and girls. A knowledge of the nature of character and the factors concerned with its development should be of especial concern to those responsible for the development of the adolescent.

Value of character study. It is obvious that matters of temperament and character are of very great importance, that they often operate independently of intelligence, and that prognosis problems cannot be adequately understood without an evaluation of these factors. The part of mentality which intelligence tests may be expected to measure includes the knowing, inventing, imagining, recalling, and combining mechanisms and others of which these are types, all closely related to the higher thought

processes but not closely related to doing. A person may show no mental disease and may know that "to lie is base," yet lying may be a repeated behavior experience of that personality. Intelligence tests are not expected to demonstrate the fact of lying experience in such a case, though the truth might develop through them incidentally.

Capacity for thinking, as interpreted by Fernald,¹ is intimately related to the degree of intelligence rather than to character; and quality of thinking and behavior is similarly related to character rather than to intelligence. The above theory is justified by the fact that responsibility for behavior is referred to character and not to a degree of intelligence except to the extent of knowing right from wrong. One is arraigned not for illegal thinking, but for illegal behavior. In this connection, Fernald says:

The inimical potentialities of those showing deviations in the field of character are far greater than those showing intelligence defects. . . . The problem of correctly identifying and classifying these aberrant personalities for incarceration, or, better for treatment and retraining, is evidently a most important and pressing sociologic issue. Attempts to transform an inimical personality into an economic unit must be directed primarily to the correction of the behavior disorder by modifying character.²

Intelligence defects are irremediable, or nearly so, while character deviations are susceptible of improvement while plasticity remains. For this reason, character should be investigated and the proper adjustments made.

Character study, then, is entitled to recognition as a categorical entity. It is distinct from the study of capacity, or degree of intelligence, and of mental disease. It is

¹ Fernald, G. G., "Character Versus Intelligence in Personality Studies," *Journal of Abnormal Psychology*, 1920, Vol. 15, pp. 1-10.

² *Ibid.*

evident that the intelligence tests, with their moderate correlation with social, scholastic, and economical achievement, are inadequate for prognosis where any high degree of certainty is desired. Thus, Doll³ pointed out some years ago that the inmates of the penitentiary frequently measure up in intelligence to the general population. Rosanoff⁴ has shown a like situation as regards the delinquents. Wells⁵ has shown proof that there is no significant relation between intelligence and mental stability. Pressey⁶ has pointed out that among public-school pupils there are nonintellectual traits that correlate as highly with scholastic achievement as do those traits measured by intelligence tests. Especially is there a low correlation between intelligence and scholarship among college students. Consequently, it is desirable that traits other than those covered by intelligence tests be investigated and measured as far as possible. Chambers⁷ found the combination of good character traits plus intelligence to be better indicative of scholastic success.

Since 1908, when Binet worked out a mental age scale, the principles that he used have been applied to the measurement of a number of different mental abilities. However, until very recent years the work centered about general intelligence on the one hand and the schoolroom

³ Doll, E. A., "The Comparative Intelligence of Prisoners," *Journal of Criminal Law and Criminology*, 1920, pp. 191-197.

⁴ Rosanoff, Carl, "Is Lack of Intelligence the Chief Cause of Delinquency?" *Psychological Review*, 1920, Vol. 27, pp. 147-157.

⁵ Wells, F. L., "Intelligence and Psychosis," *American Journal of Insanity*, 1920, Vol. 72, pp. 17-45.

⁶ Pressey, S. L., "An Attempt to Measure the Comparative Importance of General Intelligence and Certain Character Traits in Contributing to Success in School," *Elementary School Journal*, 1920, Vol. II, pp. 220-229.

⁷ Chambers, O. R., "Character Trait Tests and the Prognosis of College Achievement," *Journal of Abnormal and Social Psychology*, 1925, Vol. XX, pp. 303-311.

activities on the other. About 1921, psychologists, particularly Colvin, Pintner, and Pressey, began to feel the need to investigate the more intangible functions of the personality make-up and to ask the specific questions: What is character?, and Can it be measured quantitatively? Neither question has been permanently settled in the minds of all investigators; however, much progress has been made in this field of testing, and many reliable and valid results have been obtained.

It is the aim of a progressive education to bring about a better citizenship by improved instruction and curriculum. Much of our testing and measuring of the results of teaching is concerned with progress in knowledge, skills, and abilities, to the neglect of habits, attitudes, and ideals. For success in a complex social environment such as ours, the latter are by far the most significant. No matter how capable the person is as an individual, unless he can co-operate with his fellows and is willing that his efforts contribute to the welfare of the group, he cannot be called a success. If teaching is to be most helpful, it should aim at the improvement of the habits and attitudes of the pupils. The teacher's success is measured best by the degree of this type of improvement in her pupils.

Difficulties in character evaluation. When one reads the history of the use of scientific methods in education and psychology, he immediately recognizes that progress has been contemporary with objective methods and measurement. The great improvement in the teaching of certain school subjects which has taken place within the last two decades is due in the main to the fact that teaching methods could be evaluated objectively. As progress in method has been dependent to such a large extent upon progress in measurement, so success in character education

depends upon our ability to measure and evaluate its products.

Recent investigations have added weight to Terman's prediction in 1927 that the problem of diagnosing anti-social tendencies is as capable of scientific solution as "intelligence" measurement.⁸ However, it is impossible to use a yardstick to measure the character attributes of man, for his varying nature, coupled with his ever-changing environment, confuses all measurements and reckoning. Within recent years, various efforts have been made to study character under more carefully controlled conditions. Numerous devices for measuring character traits have been proposed. Hollingworth⁹ lists some of the more traditional methods as follows: "(1) the observation of tender parent; (2) the candidate's statement of his own qualifications; (3) the impressionistic theory of a prejudiced and ignorant interviewer." Further, he states that one might add to these three further traditional methods—methods that are in better popular repute today than are the ones just listed. These three are: "(1) the letter of application; (2) the photograph; and (3) the recommendation." Large errors creep into all of the more traditional methods of measuring character. In considering the letter of application, we at once notice that the materials it contains are subjective in nature and may be judged quite differently by different judges. It is difficult to measure character from such subjective methods. Such questions as birthplace, mother's maiden name, occupation of father, church membership, age, amount of

⁸ Wells, F. L., *Mental Tests in Clinical Practice*, Yonkers-on-Hudson, N. Y., World Book Company, 1927, p. 275.

⁹ Hollingworth, H. L., *Judging Human Character*, New York, D. Appleton-Century Company, Inc., 1922, p. 8.

schooling, soberness, special ability, and so forth, are all of interest. In judging character, one is usually at a loss in attempting to size up the applicant's true temperamental and social qualities, as well as his mental qualities, on the basis of such information.

There is a common assumption that a photograph accompanying a letter of application is a good index from which to get an insight into the individual's character. Even in the face of the general relinquishing of the claims made for phrenology and physiognomy, we find that there is still a general belief in the value of the photograph for determining character traits. Another common source of error in our judgment of others is the general central tendency of judgment. Judgments from various sources have shown that there is a tendency to judge the extremes with an error in the direction of the average. Terman¹⁰ has shown the marked tendency on the part of teachers to underestimate the ability of the bright child and to overestimate the ability of the dull child.

Character traits and school environment. Fleming¹¹ correlated twenty-seven variables in the junior high school and thirty-three in the senior high school with two criteria: scholastic achievement as measured by teachers' marks and leadership as estimated by teachers and as shown by credit points earned for offices in extracurricular activities. Ratings on nine physical and character traits were obtained and six of the *Will-Temperament Tests* were given.

¹⁰ Terman, L. M., *The Measurement of Intelligence*, Boston, Houghton Mifflin Company, 1916.

¹¹ Fleming, C. W., "A Detailed Analysis of Achievement in the High School. Comparative Significance of Certain Mental, Physical, and Character Traits for Success," *Contributions to Education*, Columbia University, Teachers College, 1925, No. 196.

School attitude was one of the traits rated and, next to intelligence, was the one most closely associated with high scholarship. The most important other traits were industry and persistence. The five factors giving the highest correlation with actual leadership in the junior high school were, in order: industry, school attitude, desire to excel, will, and intelligence. In the more advanced grades, a tendency for industry to give way to the desire to excel, in so far as these were related to scholastic achievement, was noticed.

One investigator used about 500 subjects from the ninth grades of two New York schools in studying this problem.¹² The following character traits were selected and studied as being worthy of emphasis in relation to scholastic work: initiative, control of attention, persistence, trustworthiness, and sense of accuracy.

In order to set up a more standard procedure for securing character ratings, and thus make the results more reliable, a group of teachers were selected in each of the schools to rate the pupils. Contacts with the pupils were the main basis of the selection. Only those pupils who were rated at least three times were included in the investigation. Some were rated more than three times by different raters. The various ratings were averaged and a single composite rating was secured.

The following correlations with the composite rating were found:

Median scholarship, whole group .....	.77
Median character trait, whole group .....	.792

The subjects were divided into two groups: those whose character ratings were above the median were placed in

¹² Steere, H. J., "The Effect of Character Training on Scholastic Achievement," *School and Society*, 1929, Vol. 29, p. 707.

Group I, and those with character ratings below the median in Group II. These groups were compared on the basis of the per cent of pupils who failed during one year. The pupils in Group II failed in from two to three times as much work as did the pupils in Group I. This fact is important when we consider again that these groups were equal in mental ability but differentiated on the basis of character development. Again, it is well to note that students with a low I. Q. and below the average in scholarship rating are likely to fail in their work. The character traits here studied are closely related to scholastic success, and will in turn be directly related later to vocational development and adjustment.

Vocabulary and literature and character. Every new, wholesome, dynamic word in the vocabulary of a boy or girl has character-building potentialities. Let the pupil catch the meaning and significance of *loyalty* and he will want to be loyal. Thought about the word *courage* tends to beget courage, the concept being the forerunner of the quality. Unselfishness, high-mindedness, dependability, justice, and tolerance—such concepts as these, if they are established in the consciousness of childhood and youth, will sooner or later blossom forth into an increased loveliness and beauty of character.

Literature, then, made up as it is of words, sentences, and paragraphs, and presented in books, makes its appeal through the sensory avenues of man to his more rational nature. From this appeal to rational nature, thought ensues. Thought is a result of rich and constructive ideas that are organized through the cortical areas. Thought determines action. Action is character. Words as mere words have very little dynamic meaning. Through literature, they are emotionalized; that is, they

are given a setting in terms of time, place, action, and personalities. For example, *work* as a mere word is an abstraction. But work pictured in the story of the "Village Blacksmith," whose brow is wet with honest sweat, is work presented in action and emotionalized. *Loyalty* as a mere word is an abstraction. The child who visualizes the soldier boy fighting because of love and attachment for his country, as the act is presented in literature, will have a fuller and more meaningful concept of the word. This word then becomes a symbol of heroism and may be a dynamic element in the child's varied life activities.

It can hardly be contested that books can function to a considerable degree, too, in the building of the reader's behavior traits and, thus, of his character. In certain instances, they have aided the reader to discard "rigid dogmatism and changed scepticism from sterile property of a few aloof thinkers into a fertile method of inquiry employed by many to test specific beliefs." Biographies, religious and secular, and even fairy tales and legends, have stirred up some people to a sort of righteous indignation and thus led to achievements, great and small.

Discipline and character. Closely related to the general problem of remedial treatment is discipline. Discipline in connection with antisocial behavior in school, in the home, and on the playgrounds is usually thought of as related to the milder forms of antisocial behavior. Thus, the breaking of some rule at school, the infringement upon the good will of some other member of the home or school, many acts of mischief, and other forms of behavior many of which are not necessarily antisocial behavior manifestations, are considered by someone in authority as undesirable, and, therefore, the subject concerned is disciplined by some means. Investigations show that more

teachers fail in their schoolwork owing to disciplinary problems than to any other single cause.¹³ The problem of discipline as it relates to the development of conduct in harmony with the mores of the group has been recognized in all emotional processes.

Modern conceptions of child training lay stress on the fact that morality is not developed by rules, creeds, dogmas, or the setting forth of specific amounts of punishment for various acts of mischief. Bad habits are not usually formed overnight; neither are they likely to be broken in so short a period. As in other forms of behavior patterns, changes in conduct follow the general laws of learning and occur gradually. Parents often express amazement at the apparent onset of some maladaptive form of behavior on the part of the growing boy or girl, but usually this maladaptive form of behavior has not been so sudden as it appears. Here is, in most cases, an illustration of the failure of the parent to understand the other habits that have been established prior to the appearance of unadaptive habit.

Discipline, if it is to be of value, must (1) be administered in terms of the past life of the child, (2) be based upon understanding rather than emotions, (3) be understood by the subject concerned, (4) relate to the behavior act from which it resulted rather than to the one administering the act, and (5) follow immediately after the act; discipline is related to conduct in that, through purposive activity, habits of a desirable nature are established and maintained. Discipline is therefore directly related to self-control, and it is here that all discipline should have both its beginning and its ending.

¹³ See Buellesfield, Henry, "Causes of Failures Among Teachers," *The Elementary School Journal*, 1915, pp. 439-452.

Interests, activities, and character development. In the various phases of school activities, a well-balanced individual is given the opportunity to grow and develop along the line of his interests and abilities. It is through such means that the higher levels of learning sometimes referred to as "attitudes" and "character" are developed. The individuals are given the opportunity of putting into practice many of the more or less formal teachings of the classroom. But, as we view character growth through the various school organizations, we must hearken again to the developmental viewpoint explained earlier: character growth is slow and contingent. In order that some trait shall become a living part of the individual, it must be practiced again and again under favorable circumstances. When the high-school boy or girl is active at work on the playground, in the literary society, or in some other form of activity, he is expressing himself and identifying his personality with those about him. These possibilities were expressed a number of years ago as follows:

Even at its best a group activity can do no more than adjust the participants to the ethical standards of that group, whereas moral education, especially for pupils in their teens, should aim rather at the creation of constantly higher levels of right relationship. Every teacher knows how a group can often be led to raise its moral level by suggestions from the teacher to the leading spirits, who thereupon win the others over. Consider, for example, the success of some schools in getting the code of honor system to displace the pupils' own code in which cheating is regarded as clever. What moral instruction does is to attempt more systematically to secure these better interpretations of experience and to suggest opportunities for experiences still worthier. For a school to forget this need for increasingly finer codes is to be untrue to its function as an agency of progress.¹⁴

¹⁴ Commission on the Reorganization of Secondary Education Appointed by the National Education Association, "The Moral Values of Secondary Education," *Department of Interior, Bureau of Education, Bulletin*, 1917, No. 51, p. 19.

Generalized summary. With the increased maturity accompanying adolescence, the individual's ideas become related to principles and ideals. Ideational activities and previously established habit patterns become interrelated. The habit patterns become unified and organized with respect to specific volitional situations and thus control actions relating to such situations. In the growth of the will, ideational activity which has been integrated into the beliefs and desires of the individual comes into prominence, and more and more replaces emotional forms of behavior.

Volitional growth might well be thought of as growth in self-control, which is closely related to moral and character growth. This development is especially noticeable in adolescent social play behavior. Character is clearly related to motives, and motives, being dynamic in nature, may be an outgrowth of ideas, thoughts, and feelings engendered through the various school activities.

Under the best conditions, group activity can do no more than adjust the individuals participating to the ethical standards of the group, whereas moral education, if instilled in group activity, can aim at the creation of a constantly higher level of habit systems. The very essence of moral development in the adolescent is desiring and willing in harmony with behavior patterns considered desirable by the group. So long as the adolescent is led to accept and follow blindly the dictates of someone older than himself, just so long will he fail to develop genuine moral attitudes. The individual must recognize his own ability and nature, must be led to discover his weaknesses, and must understand himself as the cause of certain happenings.

Thought Problems

1. What is character? What are some of the elements that it comprises?
2. How would you teach honesty so as to develop a transfer from information to a life of action?
3. In what way is the general school environment the laboratory of character development?
4. What are some of the difficulties involved in the development of character through the school program? What suggestions would you make relative to this condition?
5. Show how some school subject in which you are especially interested might be used in the teaching of character.
6. What school subjects or activities are especially useful for the development of desirable character qualities? How do the facts of transfer of training bear on this question?

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CHAPTER XXIV

Personality Organization

The meaning of "personality." Probably the most far-reaching biological concept developed within recent years is that relating to the idea of the unity, wholeness, or general pattern of the organism. This concept functions in the study of personality and raises the problem of the integration of the many traits into a pattern, thus giving individuality to a personality. This unitary and integrative nature operates in the case of the tropismic behavior of plants and animals and the early attentive responses of the child. When the personality of an individual is being studied, there is a consideration of the individual as a whole, although in an analytic study of a personality, traits are isolated for more careful observation and treatment. Several recent definitions of personality will give a better idea of the way in which it is regarded in the field of psychology.

We may define personality as the totality of reaction tendencies which determine the individual's effectiveness in his social environment.¹

Personality, then, is the quality of the individual's total behavior, it is how he acts, when his activity is taken as a whole.²

¹ Dockeray, F. C., *General Psychology*, New York, Prentice-Hall, Inc., 1932, p. 532.

² Woodworth, R. S., *Psychology* (rev. ed.), New York, Henry Holt and Company, Inc., 1929, p. 553.

Personality consists of the individual's native traits, both physical and mental, as modified by the diseases he has had, the food he has eaten, the people with whom he has come in contact, and the training he has received.³

Personality means that whole combination of mental and physical qualities by which an individual may be identified. It is practically the same as the idea of "self."⁴

An examination of these definitions shows a general recognition of the fact that *personality* is a rather inclusive term. There is a general emphasis upon totality, unity, or integration of elements as such a pattern tends to identify a particular individual. The personality of an individual is thus determined not only by the traits that he possesses but by the integration of his traits. Integration here refers to the general organization of traits into a larger unit of behavior, with some traits becoming subordinate to others. Personality, therefore, cannot be considered as so many separate traits; rather, the individual's personality is made up of a totality and pattern of such traits.

Measuring personality. Since personality is made of so many different variables, has so many dimensions, and presents variable qualities, it is very difficult of measurement. In the realm of human abilities and traits science has not been able to make such accurate predictions as it has made in the realm of physical forces. Probably the greatest achievements thus far rendered by science in relation to personality evaluation are found in the develop-

³ Moss, F. A., "Transient Changes in Personality," *Psychology Today* (1932), p. 93. Reprinted by permission of the University of Chicago Press.

⁴ Franz, S. I., and Gordon, Kate, *Psychology*, New York, McGraw-Hill Book Company, Inc., 1933, p. 18.

ment of useful methods of measuring some of the varying elements of personality.

A brief review of some of these methods of measuring personality elements will give the student a better understanding of the nature of the work being done in the study of personality. The methods most commonly used in studying personality are referred to as: (1) the rating scale, (2) the psychological questionnaire, (3) the personality inventory, (4) observation and analysis, (5) the psychoanalytic test, (6) behavior items, (7) the interview, and (8) psychological tests. Some of these methods and some studies relating to the adolescent's personality are presented here.

a. *Rating personality traits.* The rating scale technique has been devised to facilitate the judging of one person by another through providing the judge with a list of traits and having him state possible gradations within each trait. There are three methods in use: the individual rating scale, the man-to-man scale, and the objective test method. The individual scale lists a number of traits to be judged. The *Porteus Social Rating Scale* is an example of this method with a reliability coefficient of .70. The man-to-man scale is a method whereby one individual is rated against another. The rater makes a reference scale by selecting some person possessing a given trait to the very highest degree, someone possessing it to the very lowest degree, and someone between the two extremes. Five points are sometimes used, one being selected to represent each of the two places midway between the average and an extreme. The rater then assigns the particular individual being rated to that point on the scale where he best compares with one of the rater's five standard subjects.

b. *The questionnaire.* From the extensive efforts to approach the study of personality scientifically, there seems to have been derived the unmistakable evidence that an individual does possess certain "important trends in behavior which deserve to be recognized as traits."⁵ One of the most useful instruments which have been developed for the detection and measurement of "trends of behavior" is the questionnaire. Our interest here is in what Symonds calls the *psychological questionnaire*, the purpose of which is "to study the individual by asking questions relative to his beliefs, wishes, likes, interests, tastes, preferences, choices, feelings, fears, and worries."⁶ In spite of the fact that the answers to such questions are necessarily subjective in nature and that much depends upon the truthfulness and co-operation of the subject taking the test, Symonds asserts, "The high reliability which these questionnaires possess, show that they do measure something quite consistently. . . . In using this type of questionnaire, though one makes no assumption concerning the truthfulness of the answers, it has been found that certain answers point to conduct trends in the individual."⁷

During the World War, various studies were made in the personnel phase of psychology with soldiers as subjects. Among the phases of personality other than intelligence studied was nervous instability. Woodworth collected the various symptoms of such disorders and placed them together in such a form that they could be administered to the soldiers as a test. These various items were labeled

⁵ Allport, Gordon W., "A Test for Ascendence-Submission," *Journal of Abnormal and Social Psychology*, Vol. 23, July, 1928, p. 119.

⁶ From *Diagnosing Personality and Conduct*, by Symonds, Percival M., p. 139. Used by permission of D. Appleton-Century Company.

⁷ *Ibid.*, pp. 123 and 124.

"Personal Data Sheet" so that the general suspicion of the soldiers should not be aroused. The following questions illustrate the types used in such an inventory:

1. Do you worry too long over humiliating experiences?
2. Do a great many things frighten you?
3. Are your feelings easily hurt?
4. Do you worry over possible misfortunes?

The psychoneurotic inventory has very wide applications and has been used in various comparative studies. Such a technique is of especial value in relation to guidance, vocational psychology, diagnosing the causes of criminal tendencies, and studying abnormalities and other personality deviations.

Bridges, in a "stimulating study" using the Woodworth questionnaire on college students, concluded that college students show poorer adjustments than the general population.⁸ He found that the typical student psychoneurosis was an anxiety neurosis, the most frequent symptoms of which were disturbed sleep, worry, irritability, perseveration of ideas, and self-consciousness. (This investigation showed that, for college students, psychasthenia and the major psychoses are rare.) McLaughlin found the evidence resulting from tests of this type which have been given to high-school and college students to indicate that "not only are there a number of students in imminent need of psychiatric service, but there is also a large group of incipient cases of mal-adjustment which sooner or later must have recourse to clinical help if they are to be saved from more serious disorder."⁹ Symonds has concluded

⁸ Bridges, J. W., "Emotional Instability in College Students," *Journal of Abnormal and Social Psychology*, 1929, Vol. 22, pp. 227-234.

⁹ McLaughlin, Sister Mary Aquinas, "The Genesis and Constancy of Ascendence and Submission as Personality Traits," *University of Iowa Studies in Education*, 1930-32, Vol. VI, No. 5, p. 11.

that the maladjustment questionnaire "promises to be of service in determining by survey methods those individuals whose maladjustment with their surroundings is serious enough to warrant further individual counsel and advice."¹⁰

c. *Observation and analysis.* This method of studying personality requires a careful observation of a personality over a long period of time. Concerning it, Mark A. May says:

Three kinds of observations will be useful. First, note his physical appearance, second, his expressive movements, and third, his actual conduct. If John Doe is a little fellow, far below the average in size, it is likely that he has developed personality traits which compensate for his physique. If, on the other hand, he is a big fellow, his personality will probably be quite different.

More significant are the expressive movements. John Doe expresses his true personality in the manner and form of his actions. He has a certain gait which is all his own. The same is true of his handwriting, his style of language, manner of dress, his gestures and other movements which are more or less unconscious and involuntary. Thus each of us has his own peculiar style and form which betray his inner self to the trained eye of the scientific observer.¹¹

d. *Psychological tests.* The psychological tests are, without doubt, the most significant attempt to measure personality objectively. The test is by its nature a measuring device the giving and scoring of which is uniform. There are many different types of personality tests in use today. These tests differ from questionnaires and rating scales in that they present the subject a task which he is to perform and which may be scored on the basis of the work

¹⁰ Symonds, Percival M., *op. cit.*, p. 209.

¹¹ May, Mark A., "Measurements of Personality," *Scientific Monthly*, 1934, Vol. 38, p. 74.

done or the time taken to complete it. In many instances, these tests are very much like the questionnaire—for example, the *Allport A. S. Reaction Tests*—and the classification becomes a matter of convenience and there is little real distinction between the two. Thus, tests of appreciation, aptitudes, self-control, interests, and ascendancy-submission and many questionnaires and inventories are often referred to as psychological tests.

Personality traits of the gifted. In the work of Terman¹² and his collaborators, we find sufficient experimental evidence to indicate that intelligence precocity is not in any manner an indication by itself of an antisocial, negative, or undesirable personality. While all of the data are not wholly objective—a fact which is recognized by Terman and his co-workers—they are quite significant. There is a rather common notion that most geniuses are “freaks” or are unstable in nature: these opinions have been arrived at inductively from a few observations of some one or several particular geniuses who were more or less atypical, all people of genius being judged as if they were of a comparable type. The studies mentioned above show very clearly that, if one attempts to make even a careful subjective analysis or evaluation of the personality traits of gifted children, these children will obtain personality ratings above the average for other children of the same general status. A still more careful analysis of this group of exceedingly gifted children reveals comparisons that are rather interesting and valuable for better understanding their personality traits.

In the study by Terman and his collaborators, the question, “Is the child considered by others as ‘queer’ or ‘different’?” was answered by boys’ teachers in the nega-

¹² Terman, L. M., et al., *Genetic Studies of Genius*, Vol. I., Chaps. XIV, XVII, and XVIII, Palo Alto, Cal., Stanford University Press, 1925.

tive 95 per cent of the time for the control group and 88 per cent of the time for the superior group, or 5 per cent of the time by "Yes" for the control group and 12 per

TABLE LXV

PER CENT OF GIFTED (TEACHERS' RATINGS) WHO EQUAL OR EXCEED THE MEAN OF THE CONTROL GROUP OF CORRESPONDING SEX IN TRAIT RATINGS. (*After Terman.*)

	<i>Per Cent of Gifted Boys at or Above Control Mean</i>	<i>Per Cent of Gifted Girls at or Above Control Mean</i>
1. Health.....	58	62
2. Physical Energy.....	58	66
3. Prudence and Forethought.....	79	83
4. Self-confidence.....	81	82
5. Will and Perseverance.....	83	86
6. Musical Appreciation.....	64	68
7. Appreciation of Beauty.....	62	66
8. Sense of Humor.....	72	77
9. Cheerfulness and Optimism.....	66	62
10. Permanence of Moods.....	65	61
11. Fondness of Large Groups.....	48	55
12. Leadership.....	67	73
13. Popularity.....	53	59
14. Sensitiveness to Approval, etc.....	58	56
15. Desire to Excel.....	81	88
16. Freedom from Vanity.....	52	53
17. Sympathy and Tenderness.....	59	58
18. Generosity and Unselfishness.....	55	55
19. Conscientiousness.....	71	74
20. Truthfulness.....	72	70
21. Mechanical Ingenuity.....	48	46
22. Desire to Know.....	93	87
23. Originality.....	87	88
24. Common Sense.....	86	83
25. General Intelligence.....	98	96
Traits combined.....	70	72

cent of the time by "Yes" for the superior group. For the control and gifted groups of girls, corresponding percentages were 95 and 93 "No" and 5 and 7 "Yes." (See Table LXV.) If we take these answers as valid, we find a

slightly larger per cent of gifted than non-gifted individuals considered "queer," but normality is dominant in the gifted group for both boys and girls. In the follow-up of the reasons assigned for rating the gifted children as "queer" or "different," we find that about 50 per cent of the boys and 25 per cent of the girls had been so judged because they were "brighter," "knew more," or "acted more mature." Such answers merely indicate that a large percentage of these gifted children were judged "queer" or "different" simply because they possessed superior intelligence, rather than because they possessed some deviated personality trait noticeable in strange or awkward behavior.

In a recent study by one of the writers,¹³ correlations of $.30 \pm .06$ and $.36 \pm .06$ between scholarship and leadership scores were obtained. The leader is superior in some respects and is quite likely to be above the average of his group in mental ability.

School success is not sufficient. The child who is successful in school is usually held up as a model, and this success is looked upon as a crowning achievement of such characteristics as will power, tenacity, drive, and mental prowess. That it is actually such an achievement in many cases is not questioned here. But when this success is attained at the expense of failing to develop a well-balanced personality, it should be looked upon with askance and fear. When interest in the academic subject matter of the school leads to an all-absorbing experience, to the exclusion of the varied activities essential for the development of a well-balanced personality, it would appear that such an interest is fraught with dangers and

¹³ Garrison, K. C., "A Study of Some Factors Related to Leadership in High School," *Peabody Journal of Education*, July, 1933, pp. 11-17.

should, therefore, be carefully considered. When a high-school boy or girl gets all his life's satisfaction from his schoolwork and feels happiest and most secure when he is constantly at work on his studies, when he shows no interest in the pursuit of those activities that throw him into social experiences, then his academic interests should be looked upon as symptoms of some sort of social maladjustment.

Anne G. Beck¹⁴ suggests that often, among individuals completely immersed in their studies, either one or both of the following conditions are found: There may be established a withdrawal mechanism in which the individual finds more satisfaction and pleasure in an introverted, introspective, turning-in type of experience, rather than in a more active, extroverted, outward-going type of life which is constantly in contact with others. Secondly, there may be established a definite defense mechanism by which the individual is trying to overcompensate for some inadequacy of which he is conscious. Through such a technique he is able to obtain esteem and prestige, at least in his own way of thinking.

The case of an eighteen-year-old boy, a senior in preparatory school, who came to the Boston Psychopathic Hospital is given as an example of a withdrawal type of personality. Miss Beck says of the boy:

A personality study showed him to be the adored, perfect child, who was docile, brilliant, and of whom great things were predicted. He was personally attractive, with unusual social poise. His life before preparatory school had been spent almost exclusively in the warm bosom of female relatives, mother, grandmother, and maiden aunts. So when he

¹⁴ From Beck, Anne G., "School Success as a Withdrawal Mechanism in Two Adolescents," *The Journal of Abnormal and Social Psychology*, 1934, Vol. 29, pp. 87-94.

found himself in a boys' school, the youngsters of his own age did not interest him.

As was expected, he won first honors in his studies all along. He made efforts in athletics, dramatics, and student council leadership, in all of which he failed. He was either so nervous or so shaken with anxiety before events, or such a nuisance with his preaching for "better work" that it was felt best by everyone that he stick to his studies. He worked hard and long at his school work. He was extremely tense, and his masters felt that his high marks were at the expense of too much energy and effort, and they expected him to "break" under the strain. It was felt that he needed loosening up; that he worked so hard, his imagination was blocked; and that he was so absorbed in becoming master of his subjects, he had no appreciation for the material for its own sake. Because of his recognized ability and fine character, it was regretted that he did not mingle with the other boys except in purely intellectual situations. He had not made one friend in four years, and because of his outward disinterest, he was never included in anything other than the official school events. At home, G's success on the honor roll was looked on with great favor. They regretted that he showed little interest socially, but they were convinced that he would "blossom out" later.¹⁵

What is a deviated personality? When a child is referred to the school principal, to a habit clinic, or to other agencies for the general consideration and correction of behavior traits, we have proof that, at least, the child appears to deviate from the normal in his personality traits. The deviated personality stands in general opposition to the normal personality. When the individual varies markedly from the established order in which he happens to be placed, he presents a case of personality deviation.

Each individual is a product of various forces, biological and social. In some cases and for some traits in particular, deviations in personality are almost entirely due to

¹⁵ *Ibid.*, pp. 88 and 89.

faulty hereditary conditions; yet in the great majority of cases the social setting of an individual plays a large role as a causal factor. It is a well-recognized fact that neither inheritance nor environment tells the whole story, as has been emphasized throughout our study of the development and general characteristics of adolescent boys and girls. Some specific ratio cannot be given so that one can say, "This amount is due to heredity and that amount to environment"—as has frequently been done. In many cases of personality deviation, the environment is almost wholly at fault, while in others there is an abundance of evidence that heredity is mainly at fault. Efforts have been made to ascribe all personality difficulties to defective intelligence, but defective intelligence is only one phase of the story, since frequently persons of superior ability suffer from personality difficulties.

Wickman conducted a rather elaborate study of the attitudes of teachers towards the behavior problems of children. He had teachers rate the seriousness of the misbehavior and then had a group of mental hygienists rate the same traits according to their significance. The most interesting finding was the fact that teachers stress antagonism to work, authority, or lack of conformity in outer behavior activities as the most seriously undesirable behavior. Again, he found that the "halo effect" was likely to be very great, that teachers were likely to carry over their judgment of one type of behavior into estimates and prediction of other types. In this study it was found that mental hygienists favor and teachers usually disfavor aggressive forms of behavior. Notably, these findings are rather important to the development of a mental hygiene program for the school. Teachers should be trained to look for the causes underlying the overt expressions of

behavior disorders. In summarizing the teachers' attitudes, Wickman concludes:

That attacking types of conduct are regarded by teachers as the most undesirable forms of behavior, while many unhealthy tendencies of withdrawal and dependency are not recognized as symptomatic of maladjustment.

That the usual treatment of behavior disorders in children is directed toward the undesirable behavior which is the symptom of maladjustment, instead of toward the underlying causes that produce the maladjustment.¹⁶

Somewhat in harmony with this, we have the following recent utterance from Dr. Esther L. Richards:

It is in dealing with the temperamentally handicapped child that formal education shows the weakest side of its system. The sagging of child and adolescent in his school performance is too often treated as an ethical lapse of conduct instead of a symptom to be studied and interpreted.¹⁷

Need of group participation. The values of play in the formation of character and personality have been suggested at several points in our study. Play has been referred to as voluntary activity motivated by the satisfaction derived from the play performance. In play there is usually group activity, and its importance in relation to desirable social development is discussed in Chapter VI.

In a nation claiming democratic ideals, such as ours, one would expect team games and group activities to develop. It is by means of such activities that youths are given opportunities for self-expression, which is essential in a democratic state. Initiative, quickness of decision, interest in the group, and a co-operative spirit are qualities de-

¹⁶ Wickman, E. K., *Children's Behavior and Teachers' Attitudes*, New York, The Commonwealth Fund, Division of Publications, 1928, p. 181.

¹⁷ Richards, Esther L., "What is Dementia Præcox?" *The Journal of Pediatrics*, 1933, Vol. II, p. 51.

veloped through team activities. Team activities develop not only leadership qualities, but also a spirit of co-operation, mutual aid, and social understanding. It is through such means that the higher levels of learning sometimes referred to as "attitudes" and "character" are developed. That is, in these activities individuals are given the opportunity of putting into practice many of the more or less formal teachings of the classroom.

Adjustment of capacities, interests, and aptitudes. Failure to adjust the capacities, interests, and attitudes will result in a warped personality. It is in relation to this adjustment that guidance is especially valuable. The programs of the junior and senior high schools should be so ordered that this problem may be met. Exploratory courses, knowledge of skills, and knowledge of one's own limitations are items of value for the better adjustment of these personality elements.

Undue emphasis on subject matter and standards without a just consideration of the pupil's capacities, interests, and attitudes is responsible for a large portion of the maladjustments and problems of pupils of the junior and senior high schools. Until the center of attention of the school is shifted from subject matter to pupils, little progress will be made in better understanding the adolescent and in guiding him in the formation of such a personality as will be able to adjust to varying environmental changes. Teachers who are irritable, who do not have an appreciation of childhood, who are interested wholly in subject matter, who "don't have time" to study a problem case, who themselves are ill adjusted, are not going to be able to apply in their schoolwork principles of mental hygiene that will aid the maladjusted student. Teachers who gain the confidence and good will of their pupils,

who are eager to aid them in their problems, and who manifest an interest in their interests will be able to exert a profound influence in the prevention and treatment of problems of maladjustment.

Need for unity in development. In the organization of a well-adjusted personality, there must be a unity of development. Each personality represents a relational pattern of traits that is more or less peculiar to the individual concerned. The organization of such a pattern of traits in the high-school boy or girl requires a consideration of more than the intellectual side of life. Modern psychology conceives of the individual as a product of various forces developing as a unit.

We must recognize the fact that uncontrolled or improperly understood emotions are responsible for most of the misery and failures of life, and that, while a man can get on without being an intellectual giant, he has a poor chance if he is an emotional weakling. We are beginning to realize that human health and happiness require more than a perfectly functioning set of organs and an intellect capable of solving abstruse intellectual problems. A student may have a sound body and still be an emotional cripple; his brain may be capable of comprehending the Einstein theory, and yet he may be so badly adjusted emotionally that he is incapable of solving the simplest problem of his own everyday living. It is said, "Our children are being analyzed and classified and packed into a pattern that lacks the spontaneity and freedom that is the birthright of the child in the playtime of life."¹⁸ The home and the school must come to recognize the problems of social, educational, and health adjustments in relation

¹⁸ Brennermann, Joseph, "Pediatric Psychology and the Child Guidance Movement," *The Journal of Pediatrics*, 1933, Vol. II, p. 1.

to each individual instead of forming mechanical robots perfectly adjusted socially, vocationally, and physically according to one set scheme. Social and moral adjustments can be brought about neither through legislation nor by creed and dogma; educational adjustments can never be expected so long as we boast of our single curriculum and our single standard of requirements in our schools; health adjustments can never be developed while desirable health habits are studied and undesirable ones are practised.

Thought Problems

1. Look up further definitions of *personality*. How do these compare with the definitions quoted in the text?

2. Discuss the point of view relative to personality presented in the text. What educational implications might be drawn from it?

3. How is personality related to attitudes? To education? To character?

4. What use might be made of the rating scale in personality studies?

5. Study the personalities of several children from the same schoolroom. Note the similarities and differences and comment on your observation.

6. Rate the twenty-five behavior traits here presented from 0 to 21. Those traits that you consider exceedingly undesirable rate close to 21, while those that you consider as of only minor significance rate near 0. When you have completed this, compare your ratings with those from Wickman's study presented on page 583. How do you account for the various differences found?

- | | |
|----------------------------|---------------------|
| 1. Disorderliness in class | 9. Whispering |
| 2. Unhappy, depressed | 10. Sensitiveness |
| 3. Easily discouraged | 11. Shyness |
| 4. Tardiness | 12. Disobedience |
| 5. Heterosexual activity | 13. Temper tantrums |
| 6. Stealing | 14. Profanity |
| 7. Obscene notes, talk | 15. Laziness |
| 8. Untruthfulness | 16. Smoking |

- | | |
|----------------------------|---------------------------------|
| 17. Fearfulness | 22. Truancy |
| 18. Suspiciousness | 23. Impertinence, defiance |
| 19. Unsocialness | 24. Cruelty, bullying |
| 20. Interrupting | 25. Destroying school materials |
| 21. Overcritical of others | |

7. Study some rating scales and, using these as a guide, devise one for a number of different personality qualities.

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Appendix

Appendix

PUPIL'S INFORMATION BLANK¹

(Interest Inventory Used at the Lincoln School,
Teachers College, Columbia University)

Name Age.. Grade.. Date.... Boy.. Girl..
Home Address..... School last attended.....

I. ACTIVITIES

Those liked

Those disliked

- | | |
|---------|---------|
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |

II. GAMES—SPORTS

Those liked

Those disliked

- | | |
|---------|---------|
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |

III. SCHOOL SUBJECTS (First, list here by number all subjects in the list that you have studied during the past two years.)

.....
Those liked

Those disliked

- | | |
|---------|---------|
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |

IV. TYPES OF BOOKS

Those liked

Those disliked

- | | |
|---------|---------|
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |

¹Quoted from Hildreth, Gertrude, "An Interest Inventory for High School Personnel Work," *Journal of Educational Research*, 1933, Vol. 27, pp. 11-19.

V. BOOKS READ DURING
PAST TWO YEARS

1.
2.
3.

VI. MAGAZINES PRE-
FERRED

1.
2.
3.

VII. NEWSPAPERS READ

1.
2.

VIII. OCCUPATIONS YOU
MIGHT LIKE

1.
2.
3.

IX. PEOPLE YOU LIKE TO BE WITH IN YOUR FREE
TIME

Those liked

1.
2.
3.

Those disliked

1.
2.
3.

X. SCHOOL PREFERENCE AFTER HIGH SCHOOL

.....

XI. PERSONAL CHARACTERISTICS

Those that describe you

Those that do not de-
scribe you

- | | |
|----------|----------|
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |
| 4. | 4. |
| 5. | 5. |
| 6. | 6. |
| 7. | 7. |
| 8. | 8. |
| 9. | 9. |
| 10. | 10. |

XII. If you could have your wish for the thing you desire most,
what would it be?

.....

.....

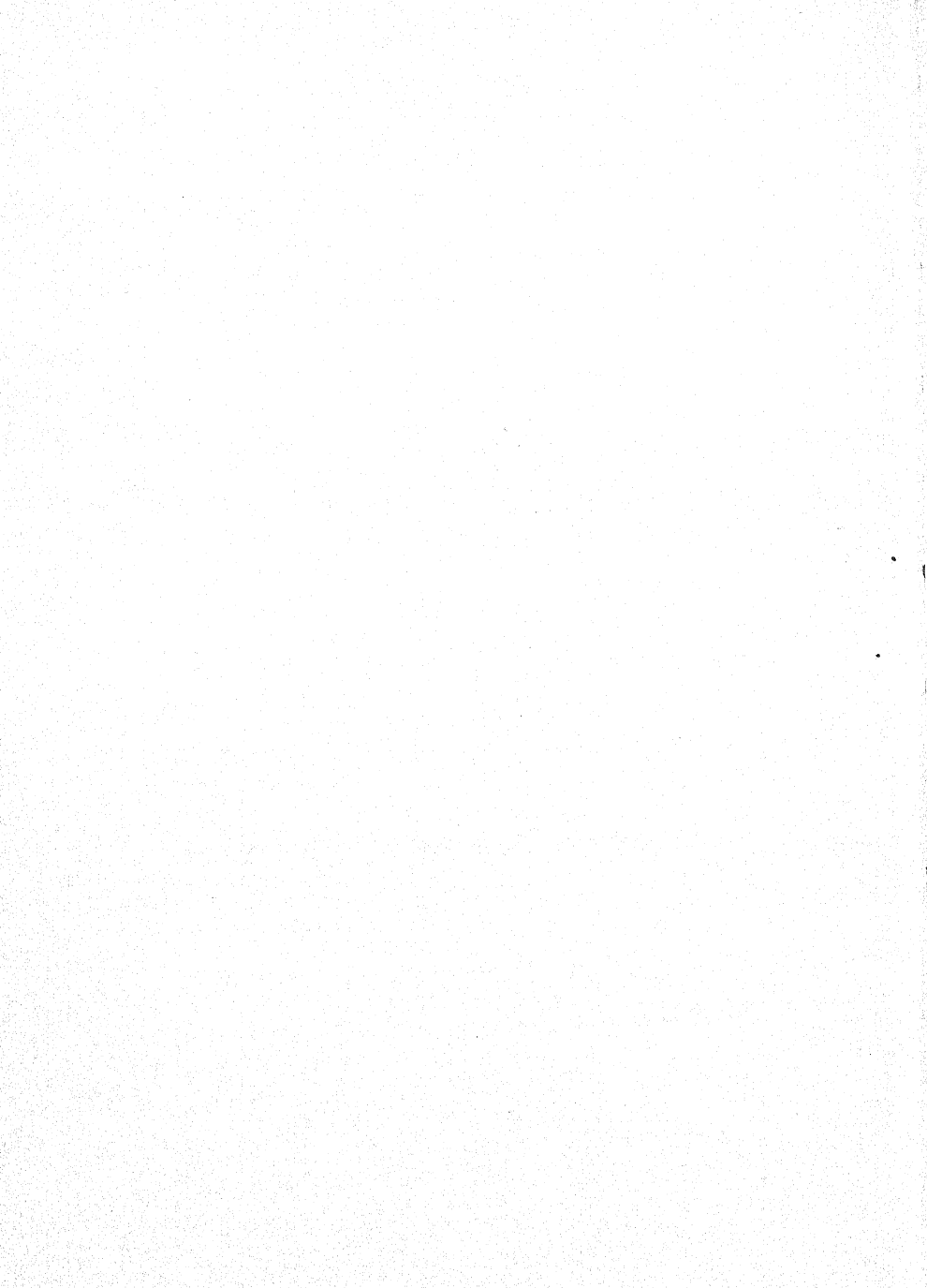
.....

TABLE LXVI

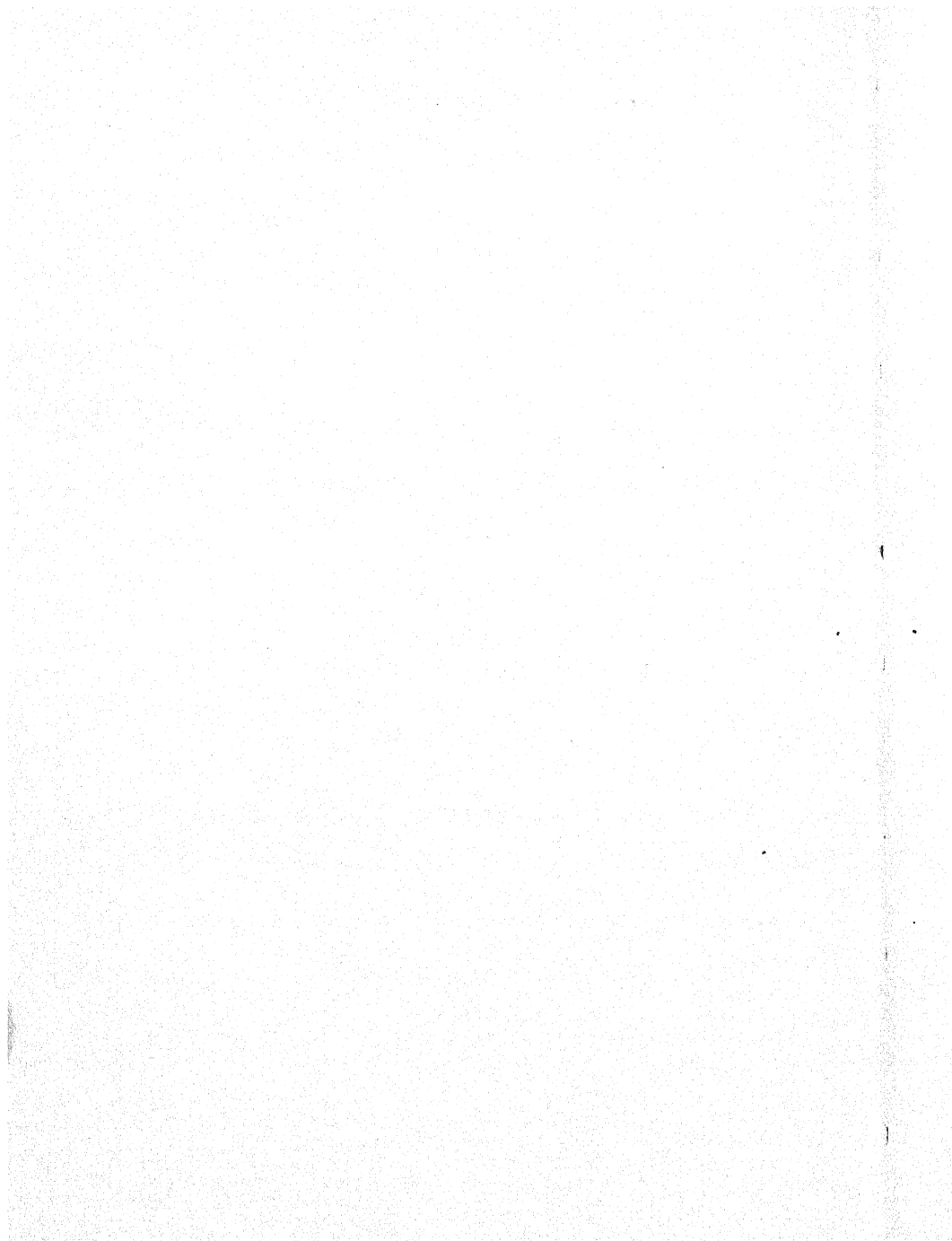
RATINGS GIVEN THE TWENTY-FIVE TRAITS PRESENTED ON PAGES 577-578. (*After Wickman.*)¹

	<i>Ratings of Teachers (511)</i>	<i>Hygienists— 90 Clinicians</i>
1.....	11.7	3.4
2.....	11.5	16.2
3.....	11.5	13.4
4.....	10.5	5.6
5.....	17.3	9.9
6.....	17.0	12.5
7.....	16.6	8.8
8.....	15.8	10.3
9.....	7.5	.8
10.....	7.0	13.1
11.....	5.4	12.5
12.....	14.1	6.4
13.....	13.0	11.7
14.....	12.3	2.9
15.....	12.2	7.2
16.....	12.0	2.3
17.....	9.7	14.0
18.....	9.1	16.4
19.....	8.3	17.3
20.....	8.0	2.8
21.....	7.9	13.2
22.....	15.6	10.3
23.....	15.0	7.1
24.....	14.8	13.5
25.....	14.3	5.1

¹ From Wickman, E. K., *Children's Behavior and Teachers' Attitudes*, New York, The Commonwealth Fund, Division of Publications, 1928, pp. 124-125.



Indexes



Subject Index

A

Ability:

- algebra, 325-328
- and interest, 132-133
- distribution, 80-85
- English, 243-246
- mechanical, 444-449
- mental, 61
- musical, 457-459

Abstraction:

- in chemistry, 383-384
- in mathematics, 307-308
- see also* Thinking

Achievement:

- curves of growth, 499-504
- measures, 481-483

Activity:

- and difficulties, 195-196
- in development, 20-22
- in science, 356-358

Adjustments, 574-576; *see also* Development; Guidance

Adolescence, 43-45

- interests, 127-146
- mental development, 70-72
- physical growth, 47-53
- plasticity, 536-537
- social development, 111-125

Aims, *see* Objectives

Algebra, 310-329

- difficulties, 318
- disability, 325
- drill, 320-322
- errors, 322-325
- measurements, 328-330
- objectives, 311-313

Algebraic notions, 315-317

Alphabet, 205-207

Analytic study *vs.* reading, 215-220

Anatomical development, 51-53

Applications:

- of home economics, 435-437
- of science, 355-356
- transfer, 188-190

Appreciation:

- and familiarity in music, 464
- development, 528-531
- in literature, 224-228

Aptitude, *see* Ability

Arithmetic, *see* Mathematics

Art, 464-472

- fields, 464-465
- measurements in, 471-472
- values of, 465

Articulation, 180-183

- in art, 469

Arts, *see* Fine arts; Practical arts

Association:

- mental set, 152-153
- see also* Learning

Athletics, *see* Physical education

Attitudes, 127-146

- change of, 526-528
- development, 517-519
- growth, 131
- measurement, 520-522
- origin, 127-128
- scientific, 523-525
- toward English, 257-259

B

Binet scale, 479

Biological sciences, 371-372; *see also*

Biology

Biology, 394-403

- and intelligence, 399-401

Biology (*cont.*):

- learning, 401-402
- measurements in, 402-403
- objectives, 396-397

C

Character:

- and discipline, 557-558
- and school environment, 554-556
- interests and activities and, 559
- study, 550-554

Chemistry, 381-394

- difficulties, 390-392
- learning, 388-390
- measurements in, 392-394

Child:

- and curriculum, 179-180
- play activities, 121-122, 134-137
- see also* Adolescence; Development; Guidance

Children:

- drawings by, 469-470
- interests:
 - in science, 349-352
 - see also* Interests

Chronology and history, 412-415

Citizenship training, 118-120, 417-419

Civics, *see* Social studies

Classification of pupils, 492-494

Competition, 164-165

Composition:

- tests, 265
- see also* Theme topics

Comprehension, 217-220; *see also* Learning

Concepts in social science, 415-419

Confusion:

- in geometry, 339-341
- see also* Difficulties

Constancy of I. Q., 31-35

Co-operative teaching, 255-257

Correlation:

- in art, 466-467
- in home economics, 438-441
- in reading activities, 212-215
- of science abilities, 363-364

Co-twin studies, 91-92

Counseling, 539-540

Curriculum, 173-187

- and contemporary life, 177-178, 411-412
- and educational aims, 174-176
- and transfer, 188-192
- differentiation, 183-187
- psychological principle, 178-179

Curves:

- educational growth, 498-504
- learning, 447-448
- mental growth, 73
- physical growth, 33-37, 47-53

D

Dentition, 52-53

Development, 18-39

- social *vs.* individual, 115-116
- unity of, 576
- see also* Growth

Developmental viewpoints, 17-18

Deviated personality, 572-574

Diagnosis, 491-492; *see also* MeasurementsDifferences, *see* Individual differencesDifferentiation, *see* Individual differences; Curriculum differentiation

Difficulties:

- algebra, 318-320
- chemistry, 390-392
- mathematics, 309-310
- science, 352-355

Disability in algebra, 325

Discipline and character, 557-558

Distributed learning, 192-193

Distribution of abilities, 80-85

Drawing, 469-470; *see also* Art

Drill:

- algebra, 320-322
- geometry, 339-341
- history, 422-423
- see also* Learning

Drives, 149-150

- as habits, 154-155

Drives (*cont.*):

attitudes as, 531-532
see also Motivation

E

Education:

and leisure, 450-451
 and social dynamics, 3-4
 early, 173
 increased importance, 1-2

Educational aims, 174-176; *see also*
 Learning

Educational growth, 497-507
 in modern language, 271-272

Educational tests as motivation,
 159-160; *see also*, New-type
 tests; Standardized tests;
 Measurements

Educational variations, 102-109

Elementary-school achievement and
 achievement in high school,
 513-515

Emotions, 113-115

English, 230-261

errors, 247-253
 learning, 253-258
 objectives, 231-232
see also Language; Modern lan-
 guages; Reading

Enrollment in school, 537-538

Environment:

and intelligence, 96-98
 and mechanical ability, 445-446
 character and school, 554-555

Errors:

algebra, 322-325
 English, 247-253
see also Difficulties

Examinations, *see* Measurements;
 Tests

Exceptional children, 184-185; *see*
also Gifted child; Individual
 differences; Inferior child

Exercise and growth, 56-58

Experience:

and reading, 212
 in science, 353-354
 Experimental method, 8-9

F

Failure, *see* Difficulties

Family tree, 86-90

Fine arts, 456-472; *see also* Music;
 Art

Foreign languages, *see* Modern lan-
 guage

Forgetting, 508-510

Foster children, 95-96

G

General intelligence, *see* Intelligence

Generalization, 188-190

General science, 365-368
 measurements, 367-368
see also Science

Geometry, 330-342

and space, 332-333

learning, 339-342

measurements in, 340-342
 objectives, 331-332

Gifted child:

interests, 141-145
 motivation, 166
 traits, 568-570

Grammar:

and language, 239-241
 modern language, 282-285
 tests, 264-265

Group consciousness, 525-526

Growth:

and exercise, 56-58
 characteristics, 30-39
 lack of uniformity in, 53-56
 unity in, 28-30
see also Educational growth;
 Mental development; Physi-
 cal development

Guidance:

and counseling, 539-540
 need for, 536-539
 tests and, 542-545

H

Habit:

as drives, 154-155
 learning, 167-168

Habit (*cont.*):

see also Learning

Heredity:

and intelligence, 89-96

family tree, 86-90

Hierarchy of habits, 448

High school, *see* Secondary education

History, 407-427

factors in learning, 408-410

measurement in, 425-427

sex differences in, 411-412, 506-507

Home economics, 434-441

and interests, 435-437

Homogeneous grouping, 492-494

Hygiene, mental, and play, 450-452

I

Imagery in history, 409-410

Imagination:

and drawing, 469-470

see also Thinking

Incentives, 150-152; *see also* Motivation

Individual differences, 80

and play, 453-454

causes of, 80-102

in art, 468-469

in education, 102-109

in home economics, 438-439

provision for:

in history, 423-424

in science, 365-367

see also Intelligence; Sex differences

Individualized work:

in English, 254-255

see also Individual differences

Inferior child, 166-167

Inheritance of acquired characters, 24; *see also* Heredity

Intelligence:

and achievement in:

biology, 339-401

chemistry, 387-388

and language ability, 243-246

Intelligence (*cont.*):

and language ability (*cont.*):

Latin, 291-293

modern language, 284-286

physics, 374-376

and mechanical ability, 444-445

see also Mental ability

Intelligence quotient:

and educational growth, 499-500

and environment, 96-98

and heredity, 89-96

constancy, 31-35

Interests, 127-146

and ability, 132-133

and character development, 558-559

and home economics, 435-437

growth, 131

in algebra, 313-315

in geometry, 335-337

in physics, 376-377

nature of, 127

origin, 128-129

permanency, 145

play, 134-137

reading, 141-143

vocational, 143-145

J

Judgments, 11-12; *see also* Thinking

Junior-high-school period and manual arts, 441-442

K

Knowledge of results in learning, 158-159

L

Laboratory method, 360

vs. lecture demonstration, 360-363

Language, 199

and intelligence, 243-246

and music, 456-457

and physics, 378-379

and thinking, 207-209

Language (*cont.*):

- difficulties in science, 352-353
- early sign, 205-207
- see also* English; Modern language; Reading

Latin, 288-305

- and intelligence, 291-293
- learning, 294-296
- measurements in, 304-305
- transfer value, 299-304

Learning, 9-10

- and curriculum organization, 188-197
- and motivation, 148-168
- biology, 401-402
- chemistry, 388-390
- English, 253-258
- modern language, 274-275
- music, 463-464
- science, 354-360
- typing, 448-449

Leisure and education, 450-451

Literature, 222-228

- and character, 556-557
- appreciation, 224-228

M

Manual arts, 441-447

- needs, 442-443
- transfer, 442-444

Mastery, *see* Drill; Reviews

Mathematics, 307-310

- difficulties, 309-310
- see also* Algebra; Geometry

Maturation, 41-42, 53-56

- hypothesis, 25, 27

Maturity:

- and chemistry, 382-384
- mental, 72-74
- social, 117-118

Measurements:

- algebra, 328-330
- art, 470-472
- biology, 401-402
- chemistry, 392-394
- geometry, 340-342
- history, 425-427

Measurements (*cont.*)

- language, 263-265
- Latin, 304-305
- mental ability, 67-69
- modern language, 286-287
- music, 461-463
- physics, 380-381
- science, 367-368
- stenographic work, 450

Measures:

- mechanical ability, 446-447
- personality, 563-567
- motor ability, 452-453
- see also* Tests

Mechanical ability, 444-447

Memory, *see* Retention

Mental ability, 61; *see also* Intelligence; Intelligence quotient

Mental development, 70-72, 75-76

Mental maturity, 72-74

Mental superiority, 87-89

Methods, *see* Learning; Teaching

Mistakes, *see* Errors

Modern language, 267-287

- and educational growth, 271-272
- learning, 274-285
- transfer value, 272-274
- vocabulary development, 281-282

Moral development, 121-122

Motivation, 148-167

- and intelligence, 165-167
- in Latin, 296-297
- in mathematics, 308-309

Music:

- as language, 456-457
- learning, 463-464
- objectives, 458-460
- social functions, 459-460

Musical talent, 460-463

N

Natural sciences, 365-368, 371-372;

- see also* Biology

New-type tests, 484-492

- and diagnosis of progress, 489-492
- teaching value, 488-489
- types, 485-486
- validity, 486-487

O

- Objectives:
 algebra, 311-313
 biology, 396-397
 chemistry, 384-385
 history, 407-408
 Latin, 289-290
 music, 458-462
 physical education, 451
 science, 346-349

P

- Participation:
 and social development, 116-117
 group, 574-575
 Part-whole learning, 193-195
 Personality:
 deviated, 572-574
 measurement, 563-567
 Physical development:
 anatomical, 51-53
 and height and weight, 47-51
 and mental development, 75-76
 methods of studying, 45-47
 Physical education, 450
 Physical sciences, 371-372
 Physique and intelligence, 76-77
 Play, 121-122
 and social development, 454-455
 individual differences in, 453-454
 interest in, 134-137
 Practical arts, 430-455
 developments in, 430-433
see also Manual arts; Physical education; Typing
 Praise and reproof, 160-164
 Probability curve, 80-85
 Prognosis, 489-491
 in college physics, 379-380
see also Measurements
 Psychological trends, 6-8
 Puberty, *see* Adolescence
 Pubescence, 43-45
 and mental growth, 71-72
 Punctuation, 251

R

- Reading, 212-215
 and literature, 222-228
 and study, 215-220
 interests, 141-143, 220-222
 modern language, 278-281
 science, 348
 tests, 261-263
 Reflective judgment, 11-12
 Remedial teaching:
 English, 255-257
see also Drill; Errors; Individual differences
 Retention, 506-508
 Reviews, 510-511
 in history, 422-423
see also Drills; Learning

S

- Schedule, 196
 Schematic drawings, 470
 School attendance and educational growth, 511-513
 School subjects:
 interests, 139-141
 variations, 102-109
see also Arts; English; Language; Mathematics; Science; Social science
 Science, 344; *see also* Chemistry; Biology; Physics; General science
 Scientific attitudes, 523-525
 Secondary education:
 curriculum, 173-187
 enrollment, 537-538
 vocational development, 431-433
 Self-activity:
 in art, 469-470
see also Participation
 Sense modalities, 195-196
 Sentence, 252-253
 Sex differences, 98-100
 algebra, 327
 geometry, 337-339
 history, 411-412, 506-507
 play, 137

- Sex differences (*cont.*):
 reading interests, 221-222
 science, 366
 sign language, 205-207
 Skill, *see* Ability
 Social behavior and emotions, 113-115
 Social development, 111-125
 function of music, 459-460
 group consciousness and, 525-526
 play and, 454-455
 science and, 122-124
 social science and, 122
 Social maturity, 117-118
 Social science, 406-427
 concepts, 415-419
 see also History
 Social studies, 406-427; *see also* Social science
 Social training, 116-117
 Spelling, 237-238
 tests, 263-264
 Stability of art, 467-468
 Standardization, dangers of, 4-5
 Standardized tests, 480-483, 493-494; *see also* Measurements
 Study, *see* Learning; Reading
 Success and motivation, 159
 of superior child, 166
 Symbolism, *see* Alphabet; Language; Mathematics

T

- Talent, *see* Ability
 Teaching, 506
 biology, 401-402
 chemistry, 385-386
 history, 412-415, 419-425
 results in physics, 380-381
 see also Learning
 Technical vocabulary, 236-237
 Teeth, *see* Dentition
 Telegraphy, 447-450
 Temporal psychology, 412-415
 Testing movement, 477-480
 Tests:
 and guidance, 542-545
 new-type, 484-489

Tests (*cont.*):

- standardized, 480-481
 see also Measures
 Theme topics, 241-243
 Thinking:
 and geometry, 333-337
 and language, 207-209
 see also Abstraction
 Time, 412-415
 Traits:
 and science, 364-365
 character, 554-555
 gifted, 568-570
 interrelation, 58-59
 Transfer, 188-192
 algebra, 317-318
 Latin, 294-296
 manual arts, 442-444
 modern language, 372-374
 science, 364-365
 Trial and error in practical arts, 420
 Types of learning, 447-448
 Types of tests, 480-492
 Typing, 447-450

U

- Unity in growth, 28-30

V

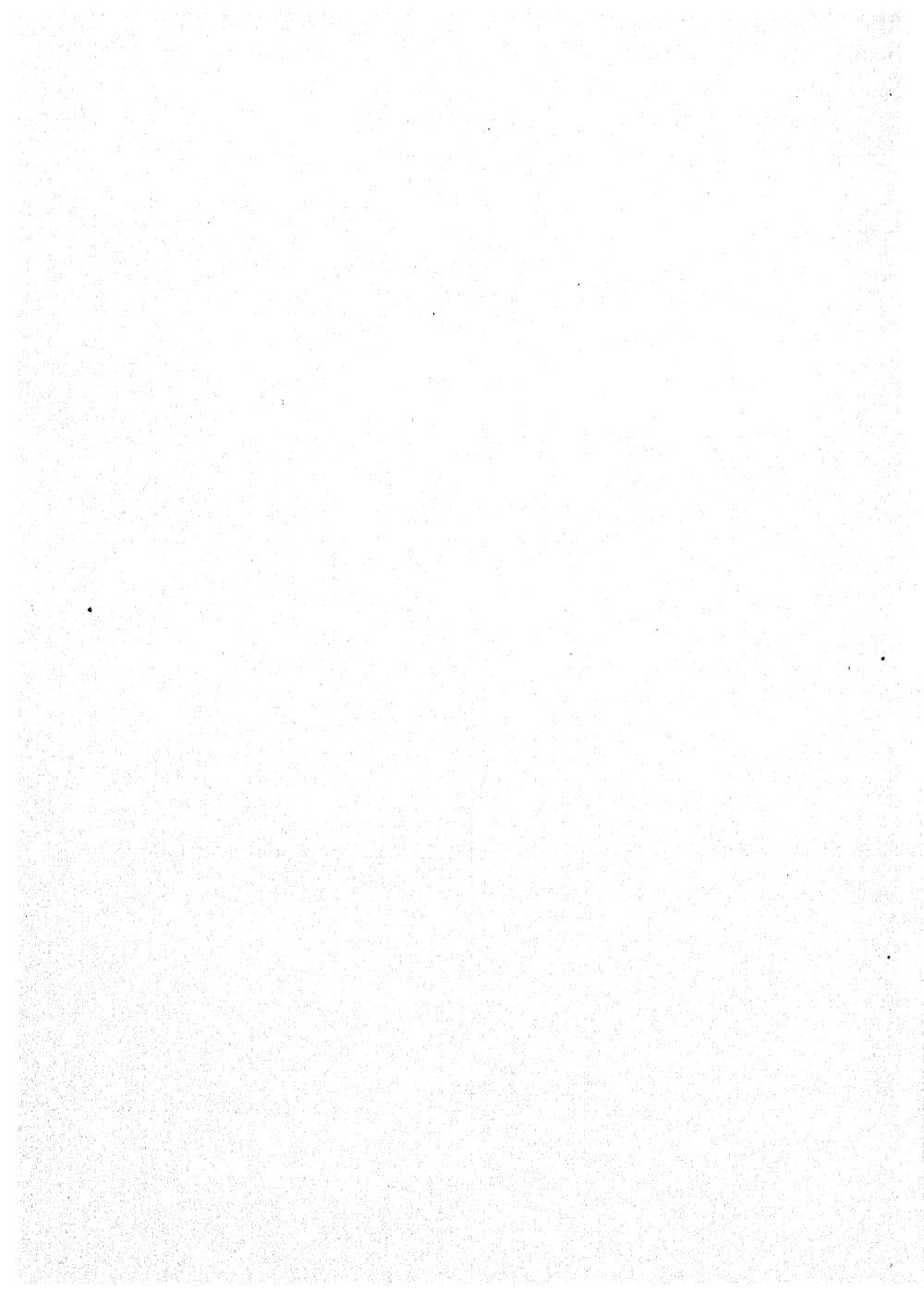
- Validity of new-type tests, 486-488
 Variations, educational, 102-109;
 see also Individual differences
 Vocabulary, 232-237
 algebra, 315-317
 and character, 556-557
 in history, 421-422
 of physics, 378-379
 see also Practical arts
 Vocational interests, 143-145; *see also* Practical arts
 Vocational training, 431-433

W

- Whole-part learning, 193-195
 Words, *see* Vocabulary
 Writing, 205-207

X

- X-ray of carpal area, 36-37



Author Index

A

Abbott, Allen, 227, 262
 Abernathy, Ethel M., 71
 Adelstein, M., 132
 Affect, G. B., 455
 Allen, Richard D., 547
 Allport, F. H., 578
 Allport, Gordon W., 565
 Anderson, L. D., 445, 446
 Angell, F., 365
 Anibal, F. G., 361
 Armacost, G. H., 487
 Arnold, H. J., 320
 Atkinson, Carroll, 359, 366
 Averill, L. A., 146

B

Baldwin, Bird T., 36, 37, 39, 43, 44, 46, 47, 48, 50, 55, 60, 64, 65, 70, 75
 Barder, H. S., 446
 Barr, A. S., 422
 Bassett, S. Janet, 132, 505, 506
 Bauer, J. R. H., 472
 Baylon, E. M. H., 561
 Bean, R. B., 47
 Beauchamp, R. O., 365
 Beck, Anne G., 571
 Beeman, Mary, 436
 Beer, Henry, 205
 Berry, Mildred Brown, 399, 400
 Betts, A. G., 170
 Binet, Alfred, 479
 Bishop, Merrill, 226, 242
 Biven, Curtis, 244
 Blaisdell, J. G., 403
 Blanchard, Phyllis, 121
 Bliss, J. F., 453
 Bolt, R., 159

Bolton, F. E., 55, 60
 Bonner, A. F., 561
 Book, W. F., 134, 140, 438
 Bovée, A. F., 284
 Boynton, Paul L., 78
 Brammell, P. R., 198
 Breazeali, Elizabeth, 281
 Breckenfield, I. L., 453
 Brennermann, Joseph, 576
 Brewer, J. M., 547
 Bridges, J. W., 566
 Briggs, T. H., 487
 Broady, K. O., 515
 Broening, Angela M., 227, 228
 Brooks, F. D., 60, 146, 505, 578
 Brown, Clara M., 455
 Brown, J. C., 138
 Brown, R. W., 464
 Brown, W., 327
 Broyles, 189, 190
 Bruce, W. F., 12
 Bryan, W. L., 447, 448
 Buellesfield, Henry, 558
 Bühler, Charlotte, 125
 Burgess, T. O., 377
 Burks, B. S., 76, 95
 Burnham, W. H., 578
 Buswell, G. T., 216, 275, 280, 352

C

Cameron, Annie E., 327
 Cameron, E. H., 228, 404
 Campbell, C. M., 578
 Campbell, D. G., 198
 Carpenter, H. A., 364
 Carpenter, Helen S., 143
 Carr-Saunders, A. M., 93

Carroll, H. A., 231, 530, 531
 Carter, H. D., 144, 145
 Caswell, H. L., 198
 Cattell, J. M., 97, 477, 478
 Cattell, Psyche, 52, 53
 Cederstrom, C. A., 398, 399
 Chambers, O. R., 551
 Chave, E. J., 522
 Child, C. M., 39
 Childs, J. L., 12
 Clem, O. M., 354, 527
 Cline, E. C., 184
 Clucas, C. S., 414
 Cobb, Margaret V., 498, 499
 Cohen, A., 162
 Coit, Wilbur A., 324
 Cole, Luella, 78, 125
 Coleman, Algernon, 306
 Conoly, Mary MacLean, 318, 322
 Coopridge, J. L., 361, 402, 403
 Coover, O. E., 365
 Corbin, A. L., 287
 Coryell, Nancy G., 220, 227, 306
 Counts, G. S., 241, 242
 Cox, W. W., 303
 Crampton, C. W., 43, 47
 Crawford, A. B., 542
 Crawford, Marianne, 239
 Crider, Beake, 298
 Crockett, A. C., 446
 Crow, C. S., 227
 Croy, M. DeW., 306
 Crudup, J., 379, 380
 Cubberly, E. L., 174
 Cuff, Noel B., 510
 Cunliffe, Rex B., 542
 Cunningham, H. A., 361

Curtis, F. D., 404, 524
Curtis, F. L., 369

D

DeLaguna, Grace Andrus, 200
Denworth, Katherine, 512
DeVoss, James C., 36
Dewey, Evelyn, 173
Dewey, J., 125, 156, 173
Diamond, L. N., 488
Dickinson, E. L., 323
Dimock, H. S., 561
Disrens, C. M., 170
Dockeray, F. C., 562
Doll, E. A., 36, 551
Donaldson, H. H., 57, 58
Douglass, Harl R., 548
Downing, Elliot R., 194, 195, 365, 395
Drake, C. E., 13
Dudleston, J. J., 354
Duffus, R. L., 472
Durrell, D. D., 320

E

Earhart, Will, 472
Earle, F. M., 545, 546
Eddy, Helen M., 306
Edgett, Lucile M., 183
Edmonson, J. B., 433
Eikenberry, D. H., 410
Elder, Vera, 143
Eldridge, Seba, 60
Elliot, R. M., 446
Engle, Edna M., 436
Enrich, A. C., 496
Evans, J. E., 245
Everett, I. P., 343

F

Farnsworth, R. R., 472
Fenton, Norman, 296
Fernald, G. G., 550
Fischer, C. R., 79
Flemming, Cecile W., 293, 554
Forlane, George, 165
Fossler, M. L., 322, 323
Franz, S. I., 563

Freeman, F. S., 31, 71, 110
Freyer, D., 146
Fryklund, D. C., 455
Fuller, L. R., 442, 443
Furfey, P. H., 113
Furnas, C. C., 431, 455

G

Gall, F. J., 477
Galton, Sir Francis, 477-479
Garner, E., 524
Garrison, K. C., 41, 60, 61, 78, 101, 102, 125, 133, 146, 153, 158, 228, 239, 244, 246, 416, 428, 527, 528, 570, 578
Garrison, S. C., 3, 35, 36, 70, 102, 158, 228, 244, 246, 354, 375, 416, 428, 514
Gates, A. L., 455, 578
Gayton, Edith, 561
Georges, J. S., 319
Germane, C. E., 561
Gerry, H. L., 385, 393
Gessell, Arnold, 21, 25, 26, 39, 72, 85, 89
Gibbons, Alice H., 428
Gifford, W. J., 12
Gilchrist, E. P., 162
Gilford, C. W., 422
Gilliland, A. R., 39
Glass, J. M., 289, 290
Goddard, H. H., 479
Goodenough, Florence, 78, 97
Gordon, K., 508, 563
Goss, Mildred J., 376
Grant, M. E., 506
Gray, W. S., 228
Greene, S. B., 509, 510
Griffiths, D. C., 533
Grise, F. C., 296, 306
Grossman, L. M., 287
Guiler, W. S., 251, 255
Gunn, Mary Agnella, 266

H

Hagboldt, Porter, 278, 279

Haggerty, N. C., 503
Haley, Alice, 455
Hamblen, A. A., 301, 302
Hamschin, C. H., 276, 278
Harap, Henry, 198
Harter, N., 447, 448
Hartshorne, H., 117, 561
Harvey, M. A., 380
Haskell, R. I., 301, 302
Hawkins, G. E., 319
Healy, W., 561
Heathcote, C. W., 428
Heaton, K. L., 561
Heidbreder, E., 446
Henderson, Archibald, 340

Hendry, C. E., 561
Henmon, V. A. C., 489
Herrick, C. J., 150
Hildreth, Gertrude, 494, 495, 515, 543, 544
Hilpert, R. S., 473
Hollingworth, H. L., 553
Hollingworth, Leta S., 264, 458, 498
Holmes, Eleanor, 220
Holsinger, K. J., 96
Hopkins, L. T., 348, 349
Huber, Miriam B., 142
Hulin, W. S., 6, 7
Hullfish, H. G., 1, 2, 176
Hunter, R. W., 369
Hunter, W. S., 507
Hurd, A. W., 375
Hurlock, E. B., 145, 161, 170
Huse, H. R., 306
Huxtable, Z. L., 245
Hypes, J. L., 520

I

Inglis, Alexander, 407, 418

J

Jacobson, P. B., 216
James, William, 155, 413, 414
Jaques, Agnes, 306
Jenkins, Frances, 233
Jennings, H. S., 39
Jensen, D. W., 108

Jensen, Friedrich, 578
Jesperperson, Otto, 199,
211
Johnson, Buford J., 78
Johnson, P. O., 509, 510
Jones, A. J., 546, 547
Jones, V., 496
Jordan, A. M., 100, 110,
142, 157
Judd, C. H., 12, 207,
216, 229, 306, 311,
334, 352, 365, 369,
343, 405, 428, 455, 337

K

Kahler, F. A., 314
Kambour, Theodore,
323
Kaulfers, W. B., 285
Kefauver, J. N., 13, 539,
548
Kelly, T. L., 11
Kepner, Tyler, 425
Keppel, F. J., 472
Kiebler, E. W., 361
King, J., 132
Kinney, L. B., 496
Kinster, M., 472
Knight, F. N., 158
Knox, L. B., 487
Koffka, Kurt, 40, 78
Koos, Leonard V., 174,
266, 306, 343, 370,
473, 548
Krueger, E. T., 517
Kwalswasser, Jacob, 473

L

LaBrant, Lou L., 229,
266
Langdon, J. N., 443
Langfield, H. S., 472
LaPlate, W. R., 453
Lasker, Bruno, 533
Lawrence, E. M., 94
Lauer, Alvah, H., 244,
245
Layton, Edna T., 504
Lee, J. M., 488
Lehman, H. C., 136,
137, 145, 146, 454
Leuba, Clarence J., 156
Lewis, K., 110
Lewman, H. H., 91

Lima, Margaret, 221
Limper, L. H., 272
Loose, Hannah, 273
Lundberg, G. A., 520,
521
Lyman, R. L., 229, 266

M

MacPhae, E. D., 305
MacQuarie, T. W., 446
Macrae, Angus, 548
MacRae, Margaret, 325
Marshall, Leon C., 408
May, Mark A., 99, 107,
117, 567
McCormick, Clarence,
343
McElivee, E. W., 444
McLaughlin, Sister
Mary Acquineas, 566,
578
Mead, C. D., 36
Meader, C. L., 200
Mehus, O. M., 90
Meltzer, Hyman, 416,
417
Merwick, Jerome, 113
Meyers, G. G., 170
Miles, D. H., 213
Miller, E. L., 256
Miller, P. S., 381, 382
Mills, Harriet H., 312
Mills, Wm. A., 312
Minnick, J. H., 138, 341
Minoque, B. M., 458
Mitchell, B. C., 96
Monroe, W. S., 324
Moon, Doris, 462
Moore, C. B., 125
Moore, Evelyn B., 524
Moore, Gwyn, 527
Moore, W. S., 319, 501
Morgan, J. J. B., 533
Morpurgo, B., 56
Moss, F. A., 563
Muller, Max, 204
Murphy, Gardner, 78,
126, 480, 578
Murphy, J. P., 561
Mursell, James L., 473

N

Narragon, 319
Nemoitin, B. O., 133

Newcomb, Edith, 292
Newman, H. H., 91
Nichols, F. C., 455
Noll, V. H., 13

O

Oakes, M. E., 370
O'Brien, F. F., 234, 235
O'Shea, M. V., 280
Otis, A. S., 291
Overman, J. R., 64

P

Page, M. L., 445
Parry, H. H., 473
Patterson, D. O., 446
Paulasigui, I., 158
Pearson, Karl, 76, 365
Pease, Glenn R., 324
Penny, Edith, 301
Perry, Winoma M., 338
Pershing, Ellis C., 405
Peterson, Joseph, 477,
478
Peterson, Ruth C., 518,
519
Phillips, C., 458
Phillips, Mabel Gross-
man, 463
Pillsbury, W. B., 200
Pintner, Rudolph, 62,
92, 496
Pollock, C. A., 350, 351
Popence, P. B., 110
Poulton, D. A., 51, 52
Powers, F. F., 198, 229
Powers, S. R., 378, 421,
490, 491, 509
Prescott, D. A., 51, 52
Pressey, Luella C., 237,
238, 316, 319, 378,
427, 501
Pressey, S. L., 319, 515,
521, 551
Price, R. A., 486
Pringle, R. W., 306
Proctor, W. M., 145
Pyle, W. N., 74

R

Ragsdale, C. E., 453
Reckless, W. W., 517
Reeder, R. R., 13
Rensen, W. C., 397

Reynolds, C. N., 538
 Rich, S. G., 387, 390, 391
 Richards, R. C., 427
 Roback, A. A., 561
 Robbins, Phyllis, 266
 Rodgers, Grace S., 250
 Rogers, D. C., 287
 Romanes, A. S., 40
 Rosander, A. C., 520, 522
 Rosanoff, Carl, 551
 Rose, C., 76
 Ross, C. C., 158, 513
 Rowland, Eleanor H., 352
 Ruch, G. M., 266, 306, 323, 343, 348, 370, 405, 428, 496
 Rucknick, C. A., 468
 Rugg, H. O., 198
 Ruggles, A. W., 450
 Ruhlen, Helen H., 226, 227
 Rulen, P. S., 370

S

Sandiford, Peter, 22, 23, 102, 496, 515
 Sanford, Vera, 343
 Sapor, Edward, 200
 Schoen, Max, 126, 473
 Schorling, R., 314
 Schwab, 578
 Schwesinger, G. C., 110
 Searle, A. H., 348
 Seashore, Carl, 461
 Seashore, S., 444
 Seaton, J. T., 502
 Seely, H. F., 266
 Shactman, Joseph, 224
 Shambaugh, C. G., 421
 Shekell, O. M., 242
 Shepherd, Edith, 257, 258, 259
 Sherman, W. D., 245
 Shipley, 24
 Shorts, C. P., 12
 Shouland, 24
 Sims, V. M., 487
 Smith, H. L., 306, 328, 330, 343
 Smith, Marcus, 527
 Smith, Meredith, 152

Snedden, David, 240
 Sommerville, R. C., 60
 Spearman, C., 62
 Starch, Daniel, 283, 291
 Stecher, Lorle I., 27, 29, 65, 70
 Steere, H. J., 555
 Steffens, L., 193, 194
 Stenquist, I. L., 444, 445
 Stewart, A. R., 385
 Stoddard, G. C., 266, 306, 370, 405, 428, 496
 Stone, C. P., 40
 Strayer, Lois Curry, 26
 Stroh, Mary Margaret, 229
 Strong, E. K., 175
 Strong, Ruth, 548
 Sullivan, Sister Celestine, 40, 112
 Sumstine, D. R., 176
 Swanson, A. M., 118
 Swindler, R. E., 429
 Symonds, P. M., 105, 178, 179, 235, 240, 266, 325, 326, 370, 405, 488, 496, 565, 567

T

Tabs, Helen, 13
 Taylor, L., 402
 Teggert, F. I., 429
 Terman, L. M., 40, 43, 70, 79, 140, 147, 221, 223, 318, 376, 383, 479, 553, 554, 568, 569
 Terry, P. W., 147
 Thomas, D. S., 126
 Thomas, Mabel, 528
 Thomas, W. I., 126
 Thompson, H., 39
 Thompson, Sir J. J., 385
 Thorn, D. A., 561
 Thorndike, E. L., 62, 69, 132, 147, 164, 189, 190, 236, 292, 300, 301, 327, 343, 479
 Thorp, J. B., 287
 Thurstone, L. L., 517, 522
 Tooman, R. S., 76
 Toops, H. A., 446

Touton, F. C., 335, 327
 Trabue, M. R., 227, 262
 Troland, L. T., 170
 Troth, D. C., 561
 Trow, W. C., 170
 Turney, A. H., 148, 492, 493
 Twiss, G. R., 370
 Tyler, Caroline, 299, 300

U

Uhl, W. L., 198, 325

V

Valentine, P. E., 578
 Vaughan, Jane, 170
 Veeder, 578
 Vendryes, J., 203, 205, 209
 Viteles, Morris S., 66, 71
 Vogt, W., 469
 Volekner, P. E., 533
 Vose, Ruth M., 257

W

Wagner, Mazie Earle, 216
 Walter, H. E., 397
 Warden, C. J., 162
 Washburne, John N., 420
 Watson, Godwin B., 578
 Watson, John B., 168
 Wattawa, Virginia, 324
 Webb, H. A., 375
 Webb, P. E., 338
 Weismann, 24
 Wellman, Beth L., 59, 76, 78
 Wells, F. L., 551, 553
 Werner, O. H., 373
 Wheat, Harry Grove, 207
 Wheeler, L. R., 84
 White, Huber B., 160
 Whitney, W. D., 204
 Wickman, E. K., 573, 574, 583
 Wiley, W. H., 363
 Williams, J. F., 452

Willing, M. H., 248
 Willoughby, R. L., 376,
 383
 Wilson, H. E., 429
 Wilson, W. R., 492
 Winch, W. H., 508
 Winslow, Leon Loyal,
 469
 Witty, P. A., 136, 137,
 145, 146, 184, 185, 454
 Wolf, M. G., 387
 Woodring, Maxie N.,
 298, 370
 Woodrow, Herbert, 191

Woodworth, R. S., 149,
 562, 578
 Woody, C., 361, 403,
 504
 Woody, T., 110
 Woodyard, 189, 190
 Wooley, H. T., 79
 Wren, F. L., 309, 343
 Wright, Katherine, 439,
 440
 Wright, Margaret Mc-
 Coy, 263
 Wright, W. W., 306,
 328, 330, 343

Wrightstone, J. W., 525

Y

Yates, Edna M., 443
 Yookam, G. B., 218, 229
 Young, Bessie A., 448
 Young, Kimball, 126,
 231
 Yule, G. U., 80

Z

Zaluondo, Celestina, 113